

**CALIFORNIA DEPARTMENT OF FISH AND GAME**  
**HABITAT CONSERVATION DIVISION**  
**Native Anadromous Fish and Watershed Branch**  
**Stream Evaluation Program**

**CENTRAL VALLEY ANADROMOUS FISH-  
HABITAT EVALUATIONS**  
**October 1998 through September 1999**

Annual Progress Report  
Prepared for  
U.S. Fish and Wildlife Service  
Central Valley Anadromous Fish Restoration Program

Habitat Conservation Division  
Stream Evaluation Program Technical Report No. 00-08

August 2000

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<sup>1/</sup> Funded by the U.S. Fish and Wildlife Service pursuant to the CENTRAL VALLEY PROJECT IMPROVEMENT ACT to improve anadromous fish habitat in California's Central Valley streams.

<sup>2/</sup> Stream Evaluation Program Technical Report No. 00-08

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## EXECUTIVE SUMMARY

The Department of Fish and Game is conducting various investigations in Central Valley streams to acquire information on anadromous salmonid populations. Results of the investigations will be used to identify flow requirements for Central Valley anadromous salmonid populations. The work is being conducted pursuant to a cooperative agreement with the U.S. Fish and Wildlife Service to satisfy requirements of the Central Valley Project Improvement Act, Section 3406(b)(1)(B).

The investigations have been ongoing since fall 1995 and have included the Sacramento, Yuba, American, Cosumnes, Calaveras, Stanislaus, Tuolumne, and Merced rivers. Data acquired on these streams varies from typing and mapping habitats using aerial photography to comprehensive evaluations and monitoring of spawner populations, spawning distribution, spawning habitat conditions, juvenile rearing, juvenile migration, and juvenile habitat conditions. The comprehensive evaluations have been primarily focused on the reaches of the Sacramento and American rivers that are influenced by Central Valley Project operations.

To date, results of the investigations on the American River have provided for improved understanding of flow requirements of salmon and steelhead. The American River data are continually being used by water management and fishery management agencies to identify optimum allocation of flow required for conserving and restoring salmon and steelhead populations in the lower American River. These data along with data collected on the Sacramento River are also being used to globally identify status and needs of salmon and steelhead as they relate to basin-wide management of water and other habitat needs. The National Marine Fisheries Service (NMFS) has and continues to use data collected on winter-run chinook salmon and steelhead to identify conservation management actions on a real-time basis. Information collected on steelhead is some of the most recent available for the Central Valley and were used by the NMFS in their deliberation of listing steelhead as threatened in the Central Valley evolutionary significant unit (ESU). This information is presently being used to help identify critical habitat for steelhead in the Central Valley ESU, and in the deliberation of the listing of spring-run, fall-run and late-fall run chinook salmon in the Central Valley ESU.

Data collected to date on the American and Sacramento rivers are also being used to refine methods used to identify habitat needs, including flow, on these rivers as well as on other stream systems within the Central Valley. One of the primary objectives of these investigations is to develop and validate scientifically credible methods for determining habitat requirements for all life stages of salmon and steelhead that depend upon Central Valley streams.

During the period summarized in this report (October 1998 through September 1999), the majority of work was conducted in the Sacramento River. Spawner surveys were conducted on all four races of salmon: juvenile rearing and emigration monitoring was conducted on salmon and steelhead. Surveys were also conducted on the Cosumnes River fall-run chinook salmon population and habitat requirements.

## INTRODUCTION

In July 1995, the California Department of Fish and Game (DFG) entered into an agreement with the U.S. Fish and Wildlife Service (FWS) to evaluate anadromous salmonid habitat requirements in Central Valley streams. Various studies have been developed and are being implemented by the Stream Evaluation Program to provide the FWS Central Valley Anadromous Fish Restoration Program with reliable scientific information. The information is to be used by DFG and FWS to develop flow recommendations to satisfy requirements of the Central Valley Project Improvement Act, Section 3406(b)(1)(B).

The basic approach to the evaluations is outlined in *Proposal to define instream flow and habitat requirements for anadromous resources in Central Valley Streams, September 1994*. The approach includes developing a better understanding of the life history of chinook salmon and steelhead trout emphasizing the relationships between life stage requirements and manageable habitat attributes (e.g., flow, water temperature, channel conditions, etc.). Initially, the evaluations concentrated on the Sacramento and American rivers. Continued investigations will include individual evaluations of spawning, rearing, and migration on these and other Central Valley streams.

One of the requirements of the agreement is to provide the FWS with annual progress reports. This report covers the investigations conducted in the Sacramento River during the period October 1998 through the last week of September 1999. During that period, DFG conducted seven general investigations (Table 1).

Table 1. Investigations conducted by the Department of Fish and Game to determine anadromous salmonid habitat requirements in Central Valley streams - October 1998 through the last week of September 1999.

Investigation	Sacramento River	Cosumnes River
Habitat mapping	Completed	Initiated
Fall-run chinook salmon spawning	X	X
Late fall-run chinook salmon spawning	X	NA
Winter-run chinook salmon spawning	X	NA
Spring-run chinook salmon spawning	X	NA
Juvenile salmonid rearing	X	X
Juvenile salmonid emigration	X	X

The results of three investigations conducted on the upper Sacramento River during the reporting period are presented as Appendices III, IV, and V. These reports cover fall-run, late-fall run and winter-run chinook salmon spawning evaluations in the Sacramento River. Appendix VI covers the survey work conducted on the Cosumnes River.

## UPPER SACRAMENTO RIVER EMIGRATION SURVEY

Emigrating juvenile salmonids were monitored using a rotary screw trap (RST) located upstream of the Balls Ferry Bridge (RM 278). The purpose of the monitoring is to determine the timing and relative abundance of salmon and rainbow trout (potentially steelhead) emigration relative to precedent conditions of spawning and rearing in the upper natal stream reach. The results presented cover the period from 1 October 1998 (week 40) through 30 September 1999 (week 40).

Sampling was conducted for most of the year, however, RST sampling effort was reduced during several weeks in October and November 1998 and September of 1999 to about 1/10th the normal sampling effort to avoid exceeding our Section 10 take limit for winter-run chinook salmon. Sampling was conducted throughout most of the remainder of the year except for occasional short periods when the traps had to be repaired.

Data acquired from the RSTs included number of hours fished and juvenile salmonids collected by species. Race for chinook salmon was determined using the length-at-time criteria developed by Frank Fisher (DFG - Red Bluff). All salmon identified as winter run, spring run, and late-fall run were measured and weighed (FL in mm and weight in g). In addition, up to 300 fall-run-sized salmon were randomly selected per trap up to twice daily, then measured and weighed. All juvenile rainbow trout were counted and measured.

Trap efficiency was evaluated by marking a portion of salmon captured (except winter run). Fish were marked with dyes either by injecting them with Alcian blue or, rarely, by bathing them in Bismark Brown Y stain. Fish captured and marked at Balls Ferry were transported upstream about 2,500 feet then released. All salmon captured were checked for marks as they were counted. Efficiency was determined weekly by calculating the percentage of marked fish recaptured.

### Emigration Results

#### Chinook Salmon

Juvenile salmon were collected every week sampled (Table 10; Figure 35). Catch rates ranged from 0.46 fish/h (week 49) to 70.34 fish/h (week 3). The highest catches were made during from late December 1998 through early February 1999 (weeks 1–6) (Figure 36). Mean weekly size ranged from 35.8 mm FL (week 50) to 83.3 mm FL (week 38). Recently emerged-sized fish (< 50 mm FL) were captured every week. Larger smolt-sized fish ( $\geq 70$  mm FL) were collected every week except weeks 40 and 50 (1998), and weeks 7 through 11 of 1999 (Appendix II - Figures 1-14).

A total of 85,166 chinook salmon was collected by RST including 1,100 spring-run sized salmon; 66,101 fall-run sized salmon, 10,585 late-fall-run sized salmon, and 7,380 winter-run sized salmon (2,201 were from brood year [BY] 1998 and 5,179 were BY 1999). Spring run catch peaked in weeks 51–2 (Figure 37). Fall run emigration peaked during weeks 2 and 3. Late-fall salmon catch peaked during weeks 18–21. Winter-run (BY 1998) emigration had already started when the reporting period began on 1 October 1998. BY 1999 winter run emigration began to substantially increase in week 38 when trapping effort was reduced to accommodate our Section 10 permit conditions.

The weekly mean size ranged from 30 to 125 mm FL for spring-run salmon (Figure 38), from 29 to 140 mm FL for fall run, from 29 to 147 mm FL for late-fall run, and from 27 to 165 mm FL for winter run.

Trapping efficiency, as measured by the recovery of dye-marked fish, ranged from 0.00% (weeks 52 and 8) to 1.42% (week 34) with a yearly mean of 0.70% (Table 11).

### **Rainbow Trout**

A total of 674 rainbow trout was captured. No steelhead were collected during weeks 45, 47, 48, 49 in November, week 51 in December, week 6 in January, week 8 in February, and week 11 in March and week 16 in April (Table 12; Figure 39). Weekly catches ranged from 0 (9 weeks described above) to 74 (week 33). Weekly catch rates (catch/h) ranged from 0.00 fish/h to 0.54 fish/h (week 40 of 1999) (Figure 40). Mean weekly size ranged from 28.0 mm FL (week 9) to 650.0 mm FL (week 7). Individual fish size ranged from 15 to 750 mm FL.

Table 10. Summary of catch statistics for chinook salmon collected by rotary screw trap at Balls Ferry (RM 278) during the upper Sacramento River emigration survey, October 1998–September 1999.

Week	Start date	Weekly catch	Catch/hr	Size statistics			
				Mean	Minimum	Maximum	SD
40(1998)	Oct 1	321	13.52	36.6	33	53	1.81
41	Oct 4	1,210	24.82	37.0	33	97	4.68
42	Oct 11	271	12.90	37.7	34	87	7.8
43	Oct 18	100	3.77	40.1	33	132	14.34
44	Oct 25	13	0.96	44.4	32	81	14.36
45	Nov 1	46	1.28	56.7	33	107	15.68
46	Nov 8	198	4.13	58.1	33	113	14.11
47	Nov 15	58	1.26	65.7	34	123	22.91
48	Nov 22	17	0.58	44.8	30	81	15.59
49	Nov 29	34	0.46	46.5	34	98	13.85
50	Dec 6	38	1.49	35.8	32	40	1.83
51	Dec 13	433	8.79	37.7	32	118	8.55
52	Dec 20	590	26.52	49.5	34	125	24.31
1	Dec 27	4,090	70.21	41.4	34	126	15.57
2	Jan 3	8,402	60.66	41.4	31	127	16.52
3	Jan 10	10,463	70.34	37.6	31	118	4.47
4	Jan 17	3,582	35.18	37.9	34	108	4.17
5	Jan 24	3,226	24.21	38.3	29	111	4.38
6	Jan 31	4,887	37.38	39.1	35	147	7.64
7	Feb 7	204	7.70	38.7	35	61	2.46
8	Feb 14	204	4.14	38.4	34	44	1.41
9	Feb 21	1,052	8.97	39.0	33	56	1.93
10	Feb 28	731	5.57	38.2	34	49	1.61
11	Mar 7	797	5.34	39.2	34	58	1.99
12	Mar 14	1,840	11.41	39.8	30	77	3.77
13	Mar 21	3,391	22.16	40.0	31	153	6.74
14	Mar 28	3,221	20.75	42.3	34	165	10.39
15	Apr 4	2,706	16.33	41.4	35	132	7.68
16	Apr 11	2,869	17.15	41.4	32	122	9.55



Table 10. (continued)

Week	Start date	Weekly catch	Catch/hr	Size statistics			
				Mean	Minimum	Maximum	SD
17	Apr 18	2,078	12.44	45.6	31	163	13.80
18	Apr 25	2,107	12.65	51.4	32	125	16.58
19	May 2	1,626	10.19	51.1	33	115	16.04
20	May 9	2,463	14.64	51.9	34	96	15.15
21	May 16	2,526	16.98	56.3	34	99	16.65
22	May 23	1,182	13.13	59.8	29	103	16.22
23	May 30	870	6.95	67.1	35	110	16.66
24	Jun 6	1,349	9.34	66.5	30	109	16.62
25	Jun 13	1,511	9.44	64.0	31	110	18.56
26	Jun 20	1,107	6.64	67.2	32	112	18.93
27	Jun 27	1,076	6.61	69.3	32	105	18.63
28	Jul 4	756	8.74	64.2	33	99	18.64
29	Jul 11	1,004	6.06	62.5	33	100	19.27
30	Jul 18	949	5.73	65.5	34	117	18.48
31	Jul 25	935	5.57	69.0	33	106	15.15
32	Aug 1	830	4.93	68.7	30	140	17.19
33	Aug 8	1,210	7.20	62.1	30	114	19.60
34	Aug 15	1,186	6.94	61.4	29	108	19.61
35	Aug 22	953	5.67	64.2	31	125	23.14
36	Aug 29	832	9.90	58.2	30	122	23.79
37	Sept 5	600	22.86	76.4	33	118	21.46
38	Sept 12	1,658	35.66	83.3	34	131	14.07
39	Sept 19	627	26.68	80.1	34	127	21.43
40(1999)	Sept 26	737	30.71	75.1	34	122	23.94
Total		85,166	15.35	51.18	29	165	19.00

Table 11. Summary of capture efficiency test results for chinook salmon collected by rotary screw trap at Balls Ferry during the upper Sacramento River emigration survey, 2 October, 1998–22 September, 1999.

Week	Number marked	Number recaptured	Efficiency (%)
40-51	0	-	-
52	470	0	0
1	1,655	18	1.09
2	5,011	68	1.36
3	6,017	36	0.59
4	350	4	1.14
5	3,013	11	0.36
6	4,425	26	0.59
7	0	-	-
8	124	0	0
9	925	7	0.76
10	643	5	0.78
11	681	2	0.29
12	1,624	11	0.68
13	3,034	22	0.73
14	2,951	13	0.44
15	2,506	13	0.52
16	2,451	11	0.45
17	1,675	12	0.72
18	1,811	14	0.77
19	1,348	17	1.26
20	2,039	21	1.03
21	2,167	10	0.46
22	873	8	0.92
23	704	4	0.57

Table 11 (continued).

Week	Number marked	Number recaptured	Efficiency (%)
24	1,197	7	0.58
25	1,165	6	0.52
26	1,009	1	0.09
27	904	2	0.22
28	362	2	0.55
29	701	5	0.71
30	762	3	0.39
31	773	5	0.65
32	665	3	0.45
33	723	10	1.38
34	703	10	1.42
35	538	3	0.56
36	321	4	1.25
37	0	-	-
38	0	-	-
39	0	-	-
Total	56,320	394	0.70

Table 12. Summary of catch statistics for rainbow trout collected by rotary screw trap at Balls Ferry (RM 278) during the upper Sacramento River emigration survey, October 1998–September 1999.

Week	Start date	Weekly catch	Catch/hr	Size statistics			
				Mean	Minimum	Maximum	SD
40(1998)	Oct 1	5	0.21	62.8	41	110	24.8
41	Oct 4	3	0.06	59.3	52	72	8.9
42	Oct 11	4	0.19	57.0	36	68	13.7
43	Oct 18	3	0.11	131.7	51	180	57.4
44	Oct 25	1	0.07	100.0	100	100	-
45	Nov 1	0	-	-	-	-	-
46	Nov 8	5	0.10	148.8	47	390	124.8
47	Nov 15	0	-	-	-	-	-
48	Nov 22	0	-	-	-	-	-
49	Nov 29	0	-	-	-	-	-
50	Dec 6	1	0.04	155.0	155	155	-
51	Dec 13	0	-	-	-	-	-
52	Dec 20	3	0.13	83.0	75	95	8.6
1	Dec 27	2	0.03	73.5	71	76	2.5
2	Jan 3	3	0.02	209.3	88	380	124.2
3	Jan 10	4	0.03	482.5	160	750	229.6
4	Jan 17	3	0.03	256.7	70	500	180.1
5	Jan 24	1	0.01	67.0	67	67	-
6	Jan 31	0	-	-	-	-	-
7	Feb 7	1	0.04	650.0	650	650	-
8	Feb 14	0	-	-	-	-	-
9	Feb 21	1	0.01	28.0	28	28	-
10	Feb 28	1	0.01	79.0	79	79	-
11	Mar 7	0	-	-	-	-	-
12	Mar 14	1	0.01	54.0	54	54	-
13	Mar 21	1	0.01	280.0	280	280	-
14	Mar 28	3	0.02	87.0	71	95	11.3

Table 12. (continued)

Week	Start date	Weekly catch	Catch/hr	Size statistics			
				Mean	Minimum	Maximum	SD
15	Apr 4	3	0.02	149.3	58	310	113.9
16	Apr 11	0	-	-	-	-	-
17	Apr 18	17	0.10	69.5	51	200	34.2
18	Apr 25	59	0.35	62.0	40	84	9.4
19	May 2	32	0.20	56.5	37	74	7.6
20	May 9	65	0.39	56.6	28	210	23.8
21	May 16	40	0.27	68.2	37	450	61.9
22	May 23	17	0.19	54.6	26	71	10.6
23	May 30	9	0.07	55.9	34	62	8.0
24	Jun 6	7	0.05	108.0	50	410	123.4
25	Jun 13	15	0.09	48.9	27	80	17.7
26	Jun 20	28	0.17	41.0	21	93	18.8
27	Jun 27	31	0.19	39.5	24	87	18.6
28	Jul 4	12	0.14	35.1	25	60	11.6
29	Jul 11	30	0.18	48.9	21	112	26.9
30	Jul 18	18	0.11	56.4	23	117	28.2
31	Jul 25	14	0.08	53.9	25	97	19.8
32	Aug 1	24	0.14	48.8	28	98	15.6
33	Aug 8	74	0.44	49.0	15	114	16.2
34	Aug 15	45	0.26	54.8	22	106	16.8
35	Aug 22	22	0.13	57.7	41	86	12.1
36	Aug 29	31	0.37	57.3	41	99	15.4
37	Sept 5	5	0.19	62.0	55	68	5.2
38	Sept 12	12	0.26	62.8	48	92	14.2
39	Sept 19	5	0.21	90.0	65	140	29.6
40(1999)	Sept 26	13	0.54	67.2	48	82	11.3
Total		674	0.12	62.2	15	750	28.5

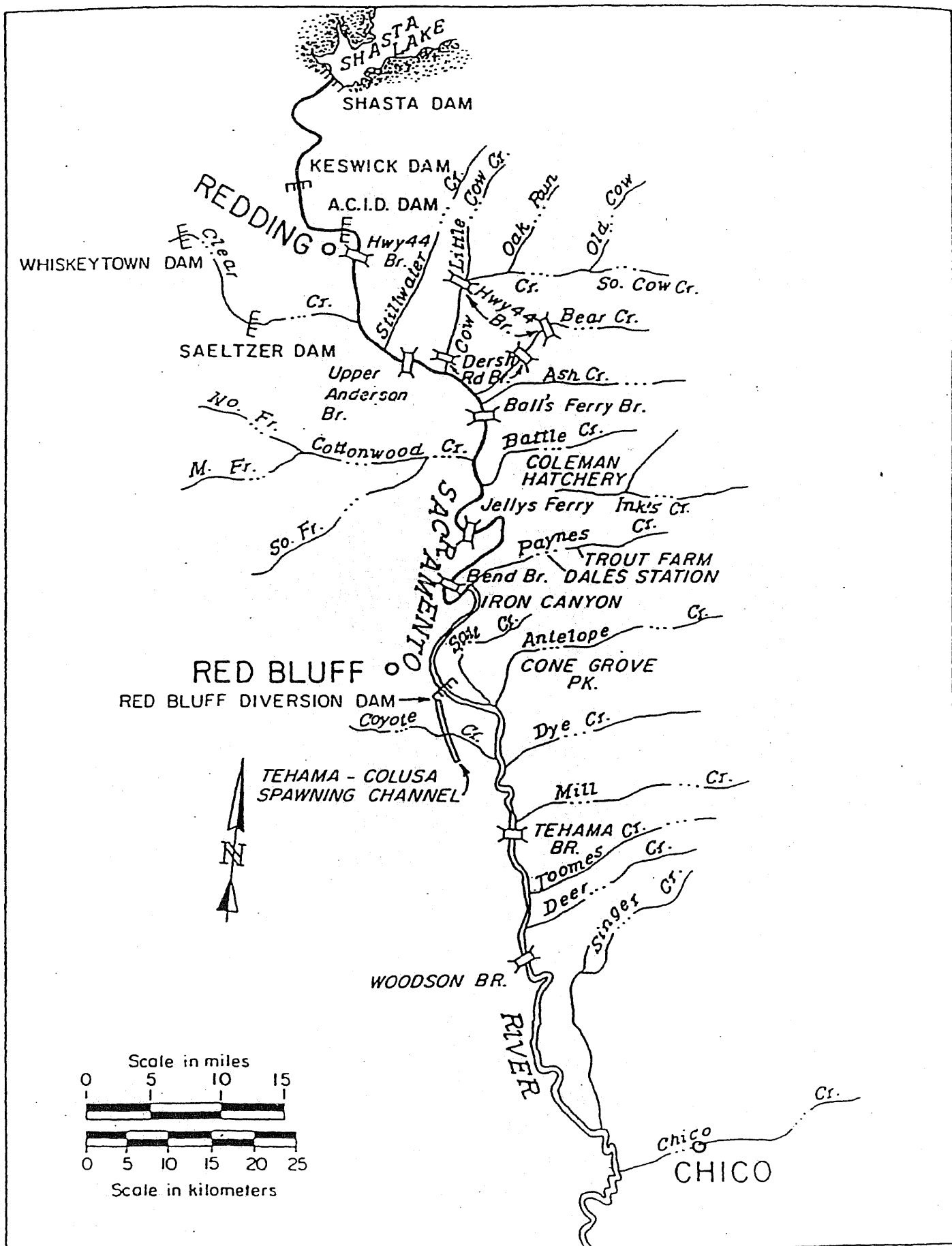


Figure 1. Upper Sacramento River.

# Effort and chinook salmon catch rate Upper Sacramento River rotary screw trap

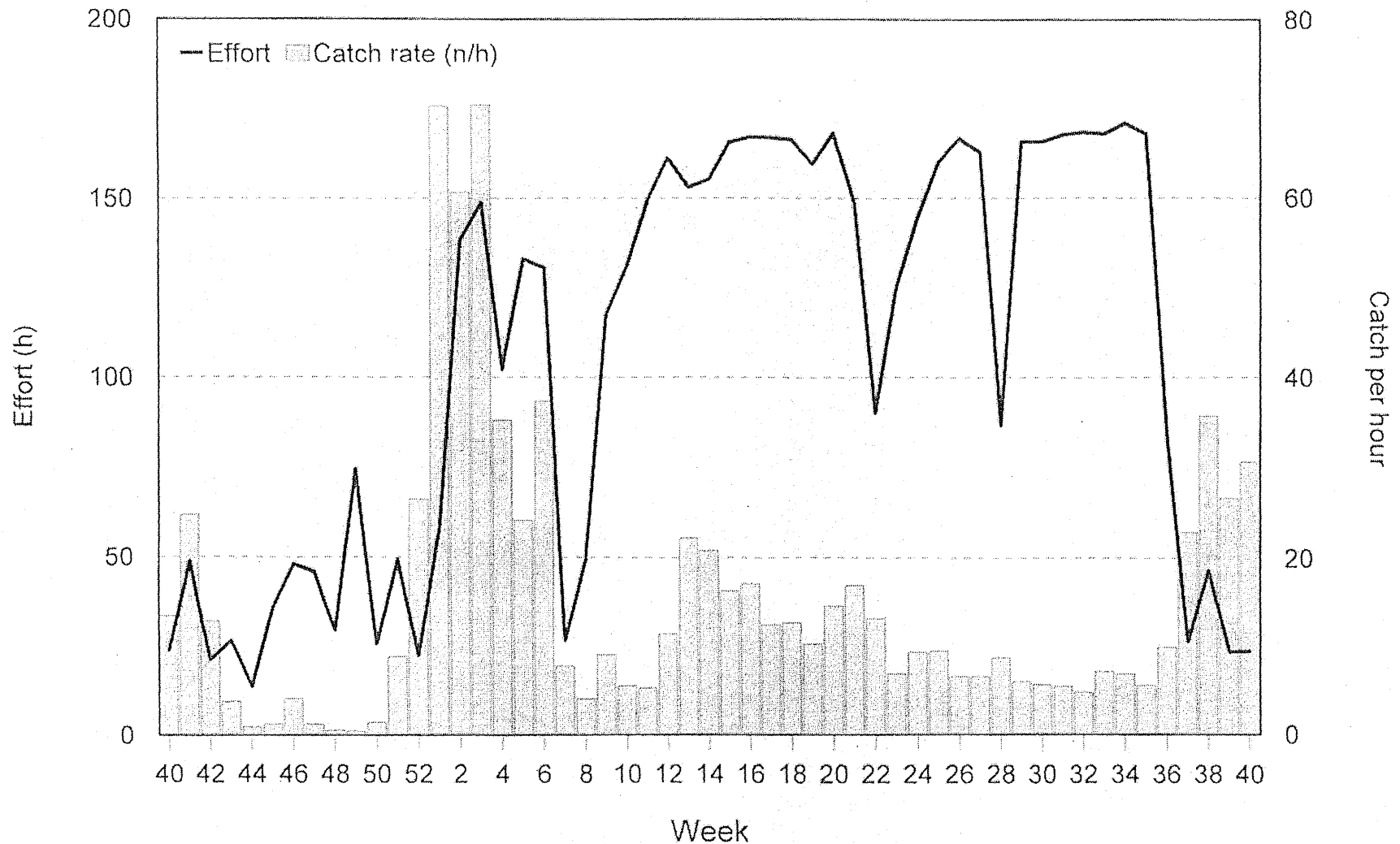


Figure 35. Weekly catch rate of chinook salmon and hours fished by rotary screw trap in the upper Sacramento River, 1 October 1998 - 30 September 1999.

# Size statistics and weekly catch of chinook salmon

## Upper Sacramento River rotary screw trap

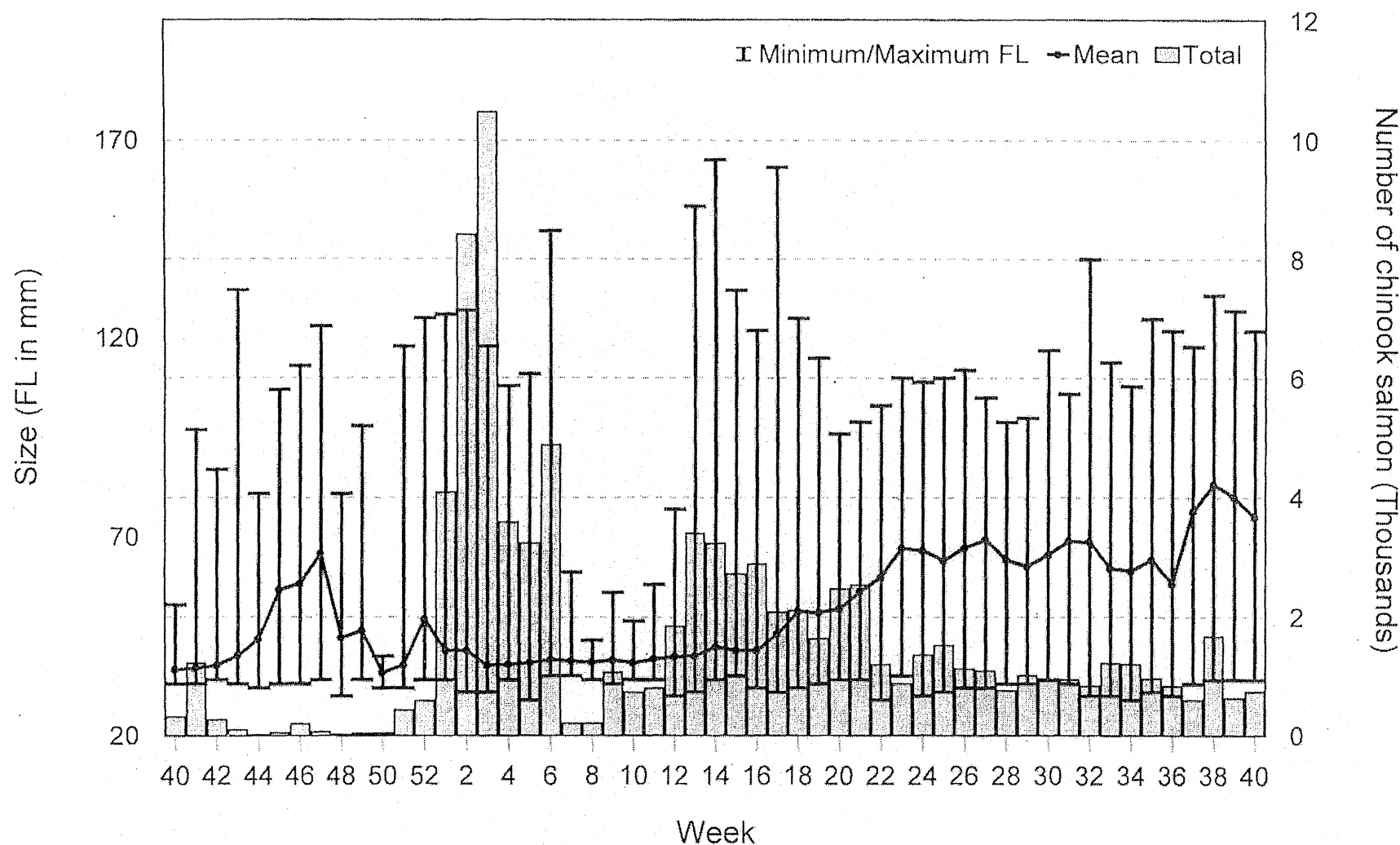


Figure 36. Weekly catch and size statistics of chinook salmon caught by rotary screw trap in the upper Sacramento River, 1 October 1998 - 30 September 1999.



# Chinook salmon catch distribution by race Upper Sacramento River rotary screw trap

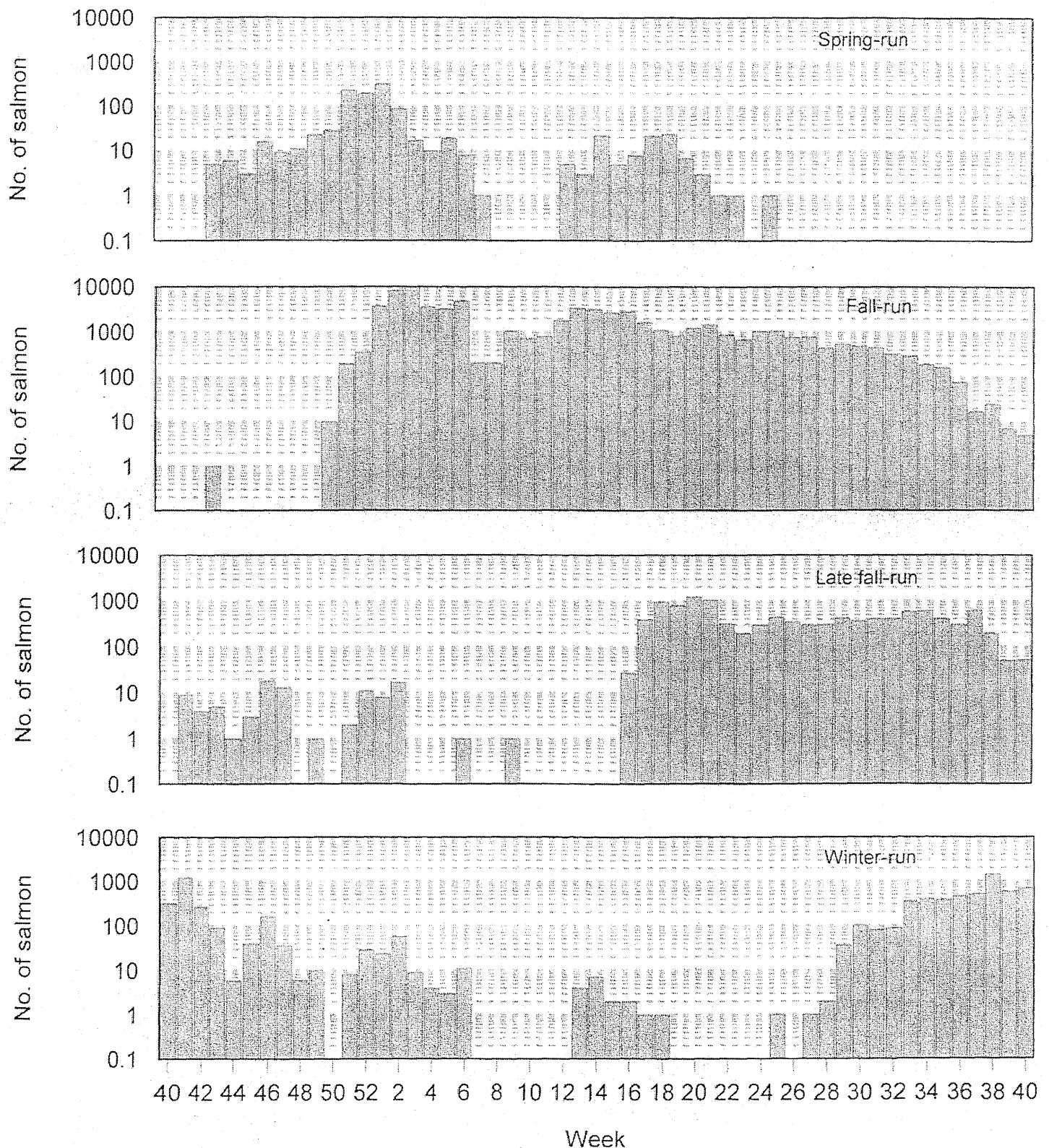


Figure 37. Catch distribution of chinook salmon races collected by rotary screw trap in the upper Sacramento River, 1 October 1998 - 30 September 1999.

# Chinook salmon size distribution by race Upper Sacramento River rotary screw trap

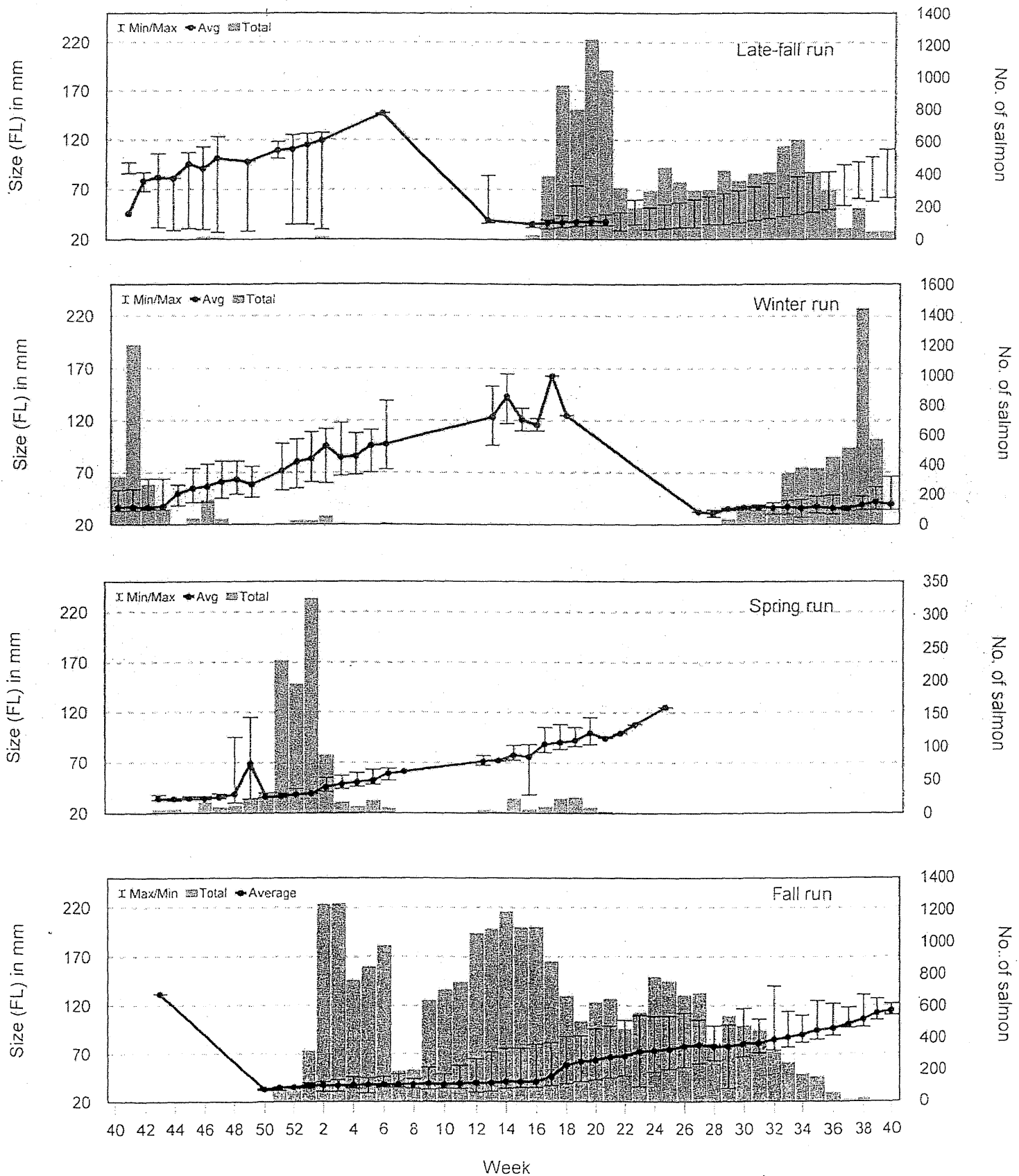


Figure 38. Weekly catch and size statistics for the four races of chinook salmon collected by rotary screw trap in the upper Sacramento River, 1 October 1998 - 30 September 1999.

# Size statistics and weekly catch for rainbow trout in the upper Sacramento River Rotary screw trap survey 1998-1999

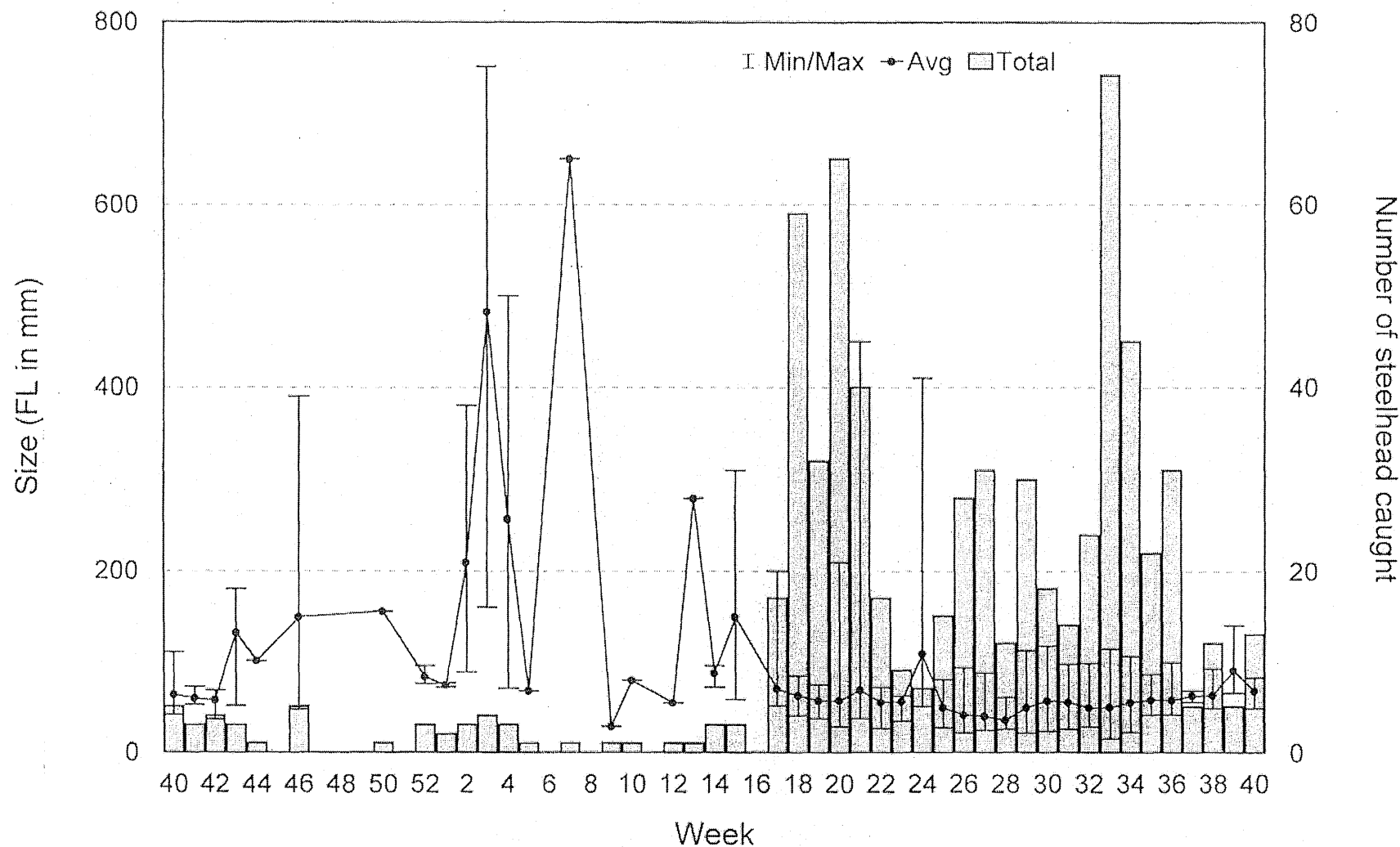


Figure 39. Weekly number and the mean size (minimum and maximum FL) of rainbow trout caught by rotary screw trap in the upper Sacramento River, 1 October 1998 - 30 September 1999.

# Effort and rainbow trout catch per hour in the upper Sacramento River Rotary screw trap 1998-1999

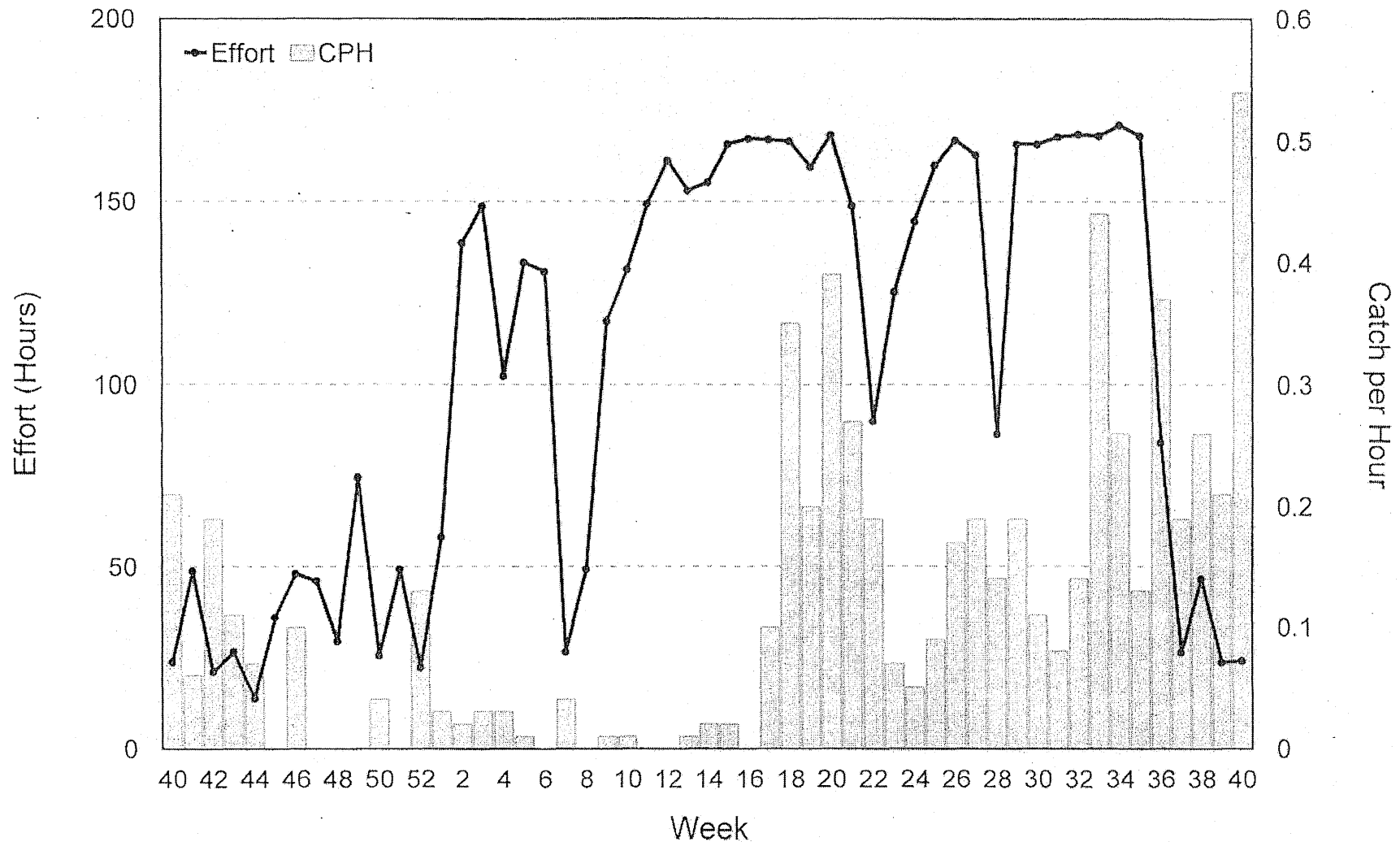


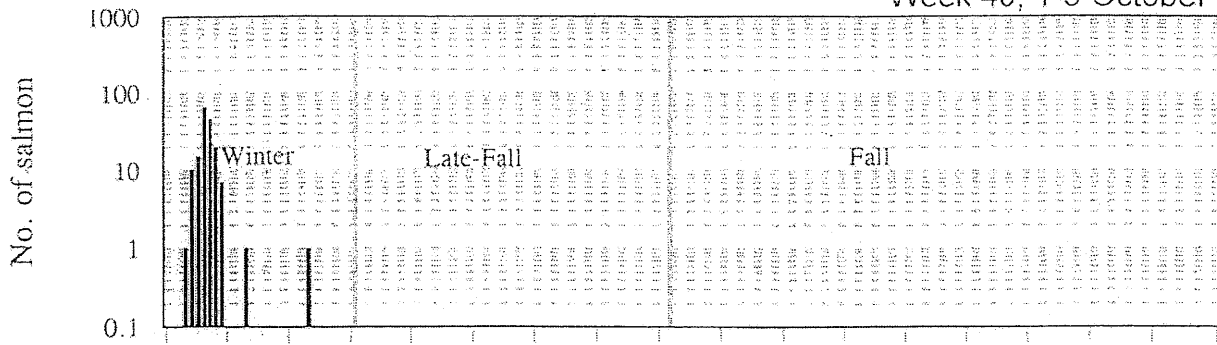
Figure 40. Weekly catch per hour of rainbow trout and hours fished by rotary screw trap in the upper Sacramento River, 1 October 1998 - 30 September 1999.

## **APPENDIX II**

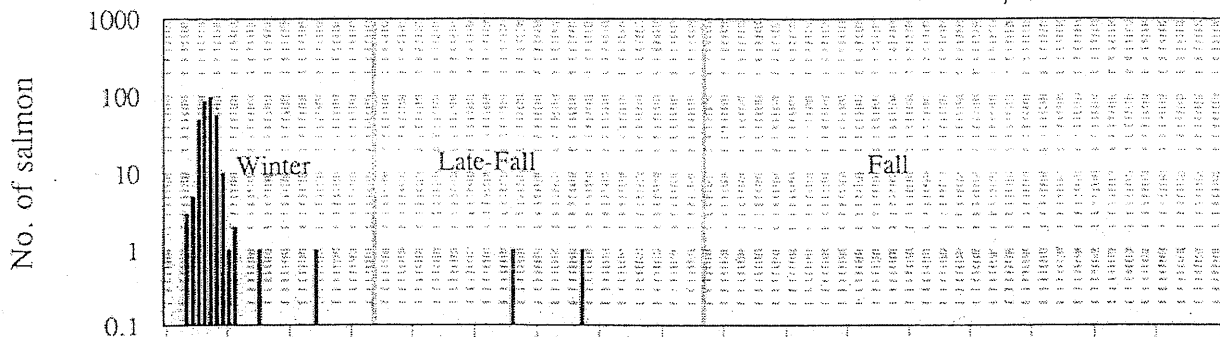
**Rotary screw trap catch weekly length distribution**

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

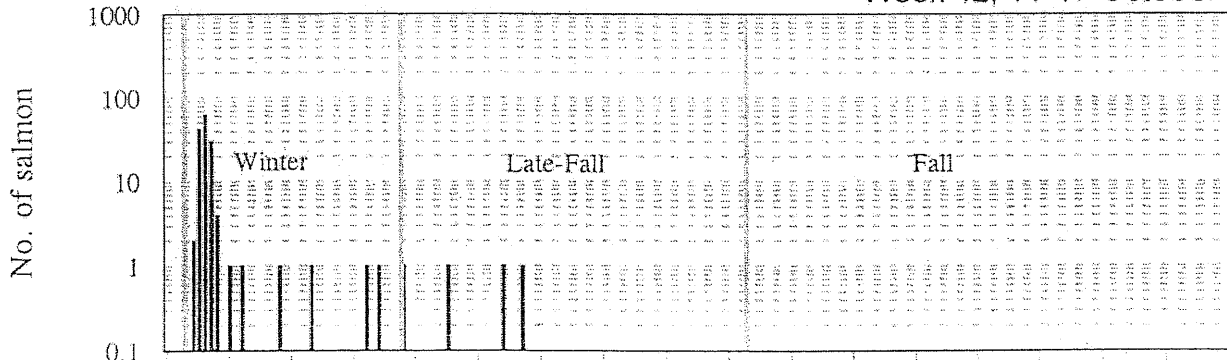
Week 40, 1-3 October



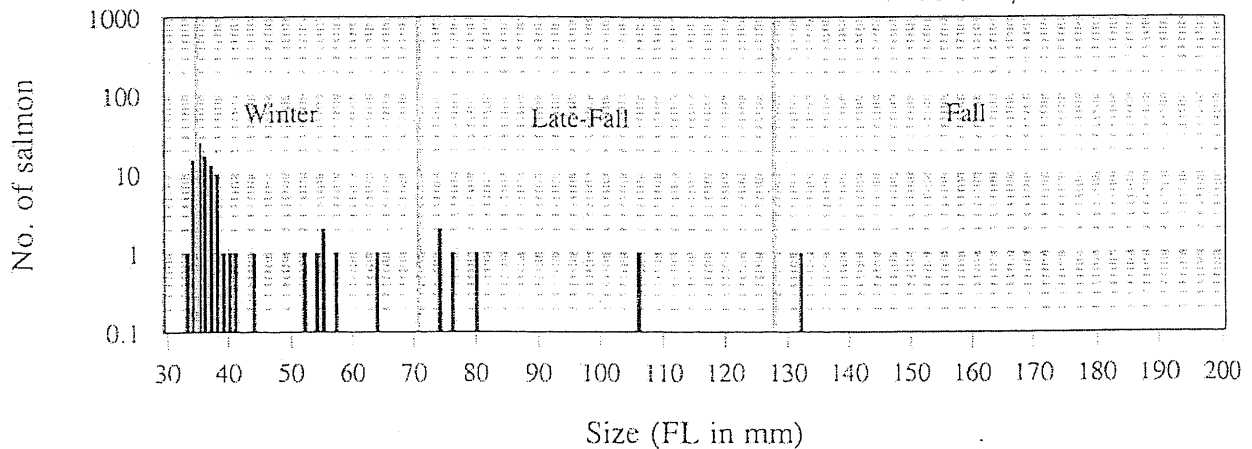
Week 41, 4-10 October



Week 42, 11-17 October



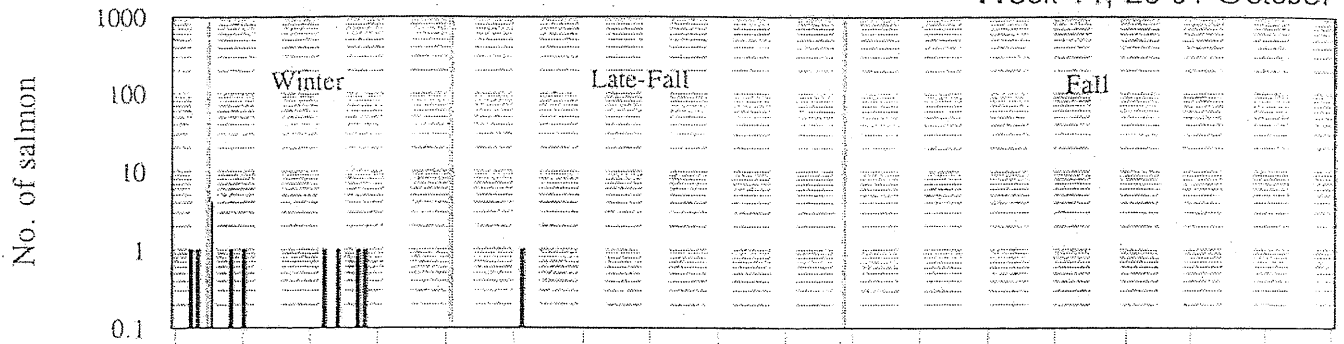
Week 43, 18-24 October



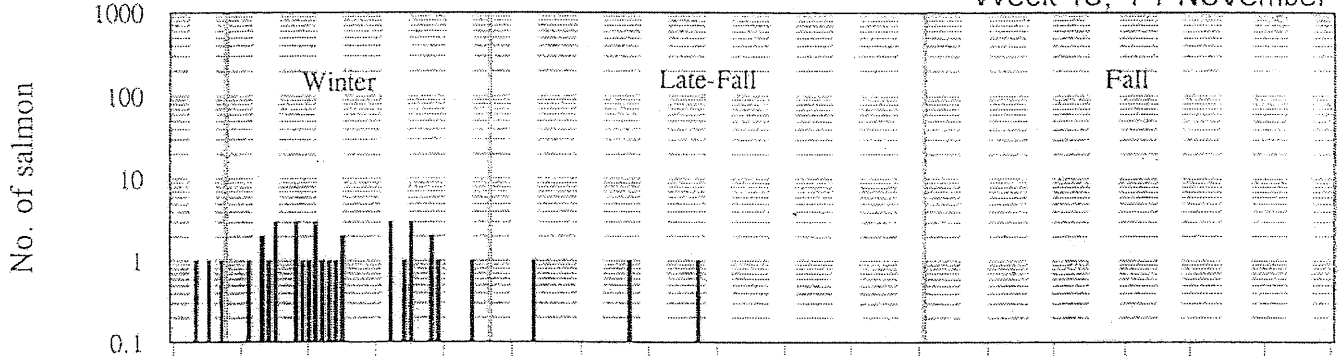
II-1. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 1 October 1998 - 24 October 1998.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

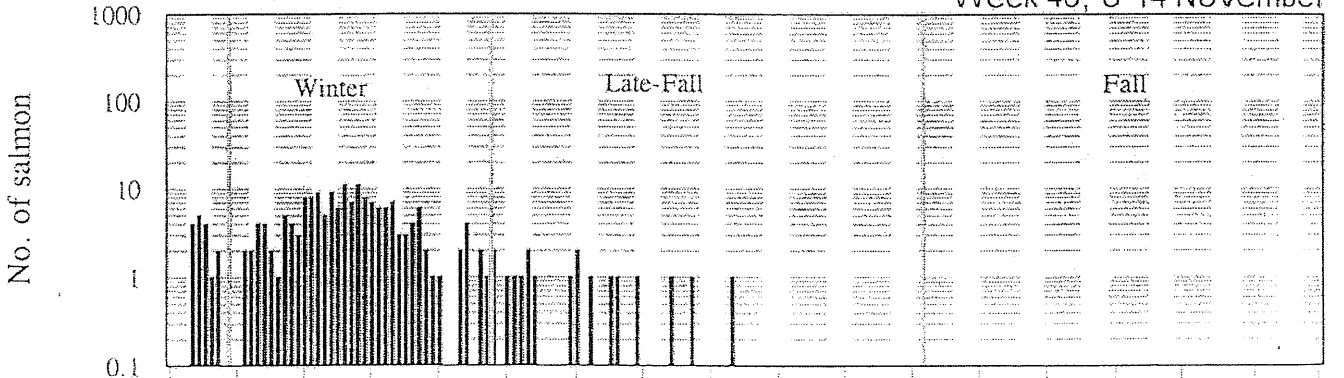
Week 44, 25-31 October



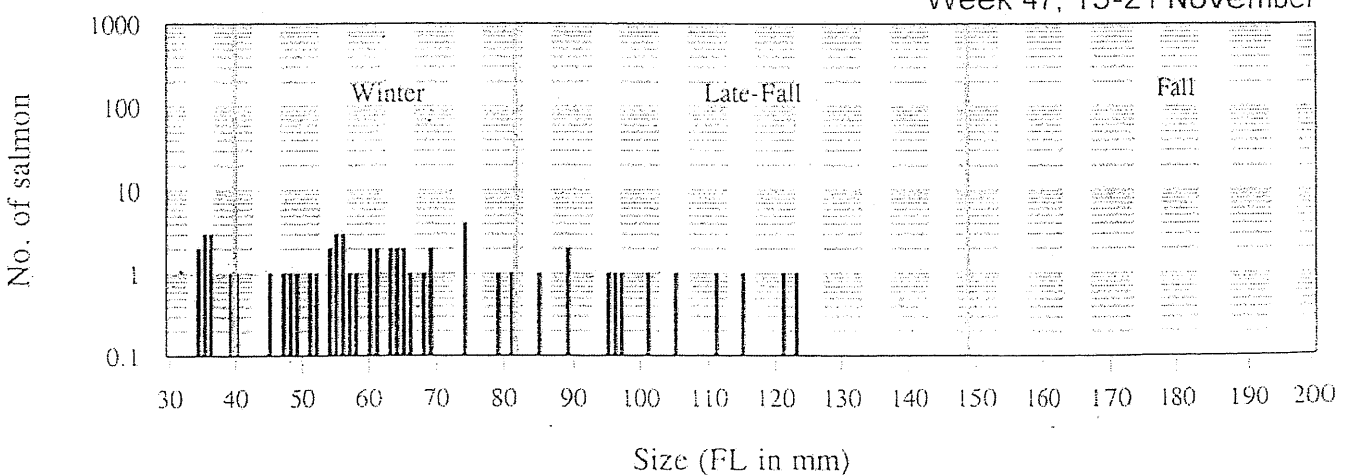
Week 45, 1-7 November



Week 46, 8-14 November



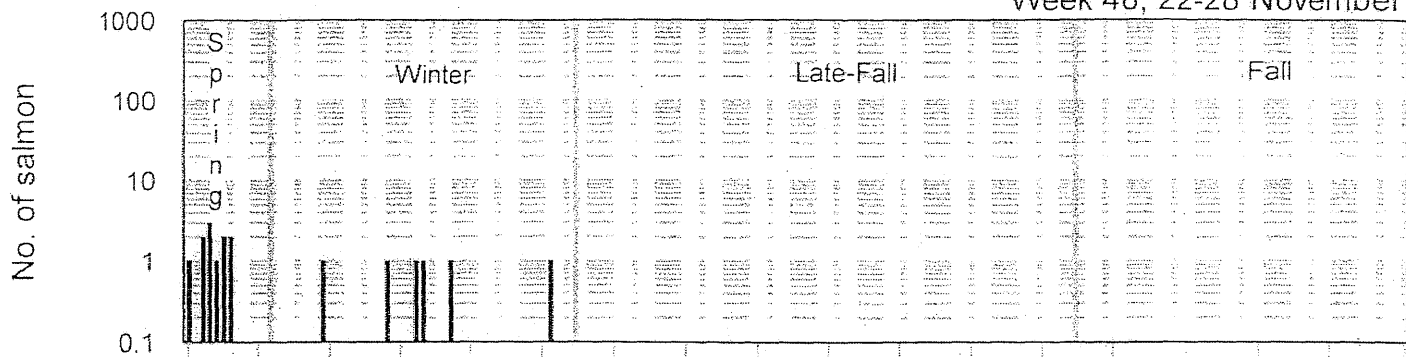
Week 47, 15-21 November



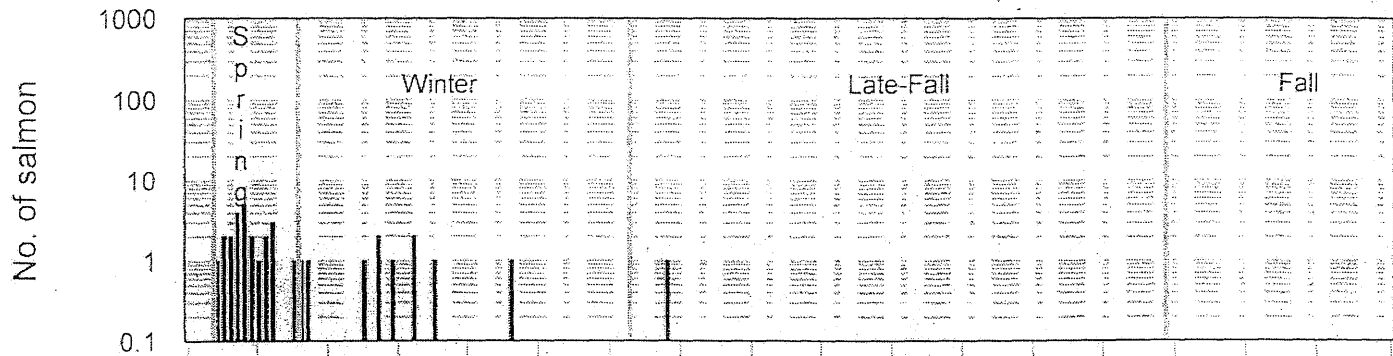
II-2. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 25 October 1998 - 21 November 1998.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

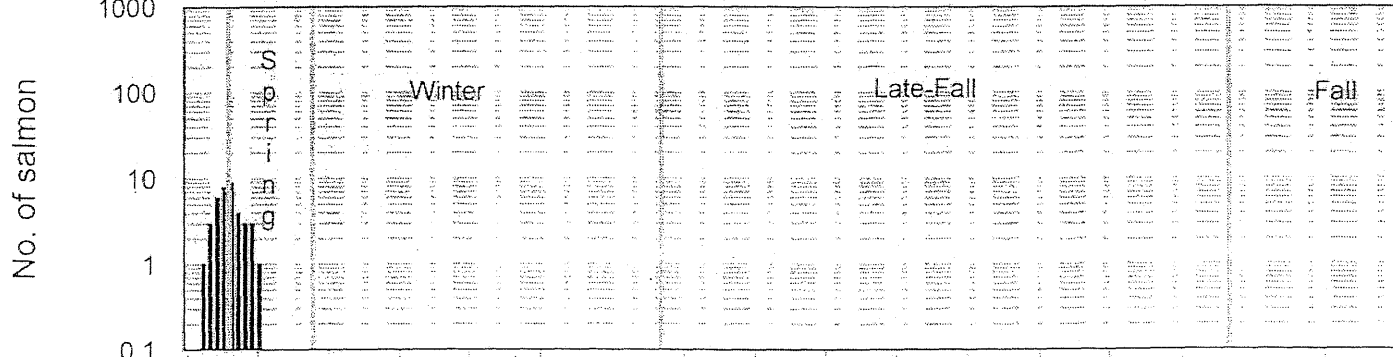
Week 48, 22-28 November



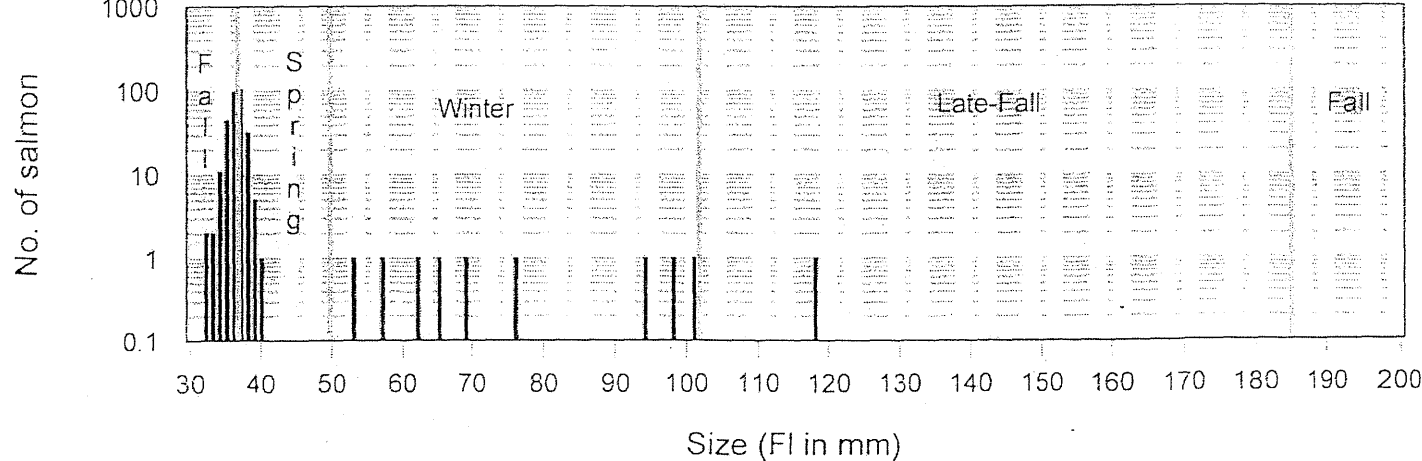
Week 49, 29 November - 5 December



Week 50, 6 - 12 December



Week 51, 13 - 19 December

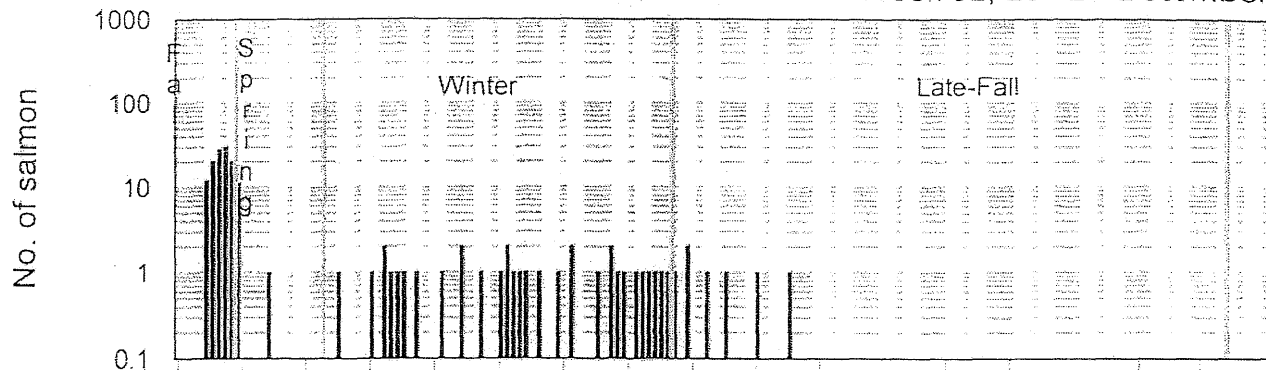


II-3. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 22 November 1998 - 19 December 1998.

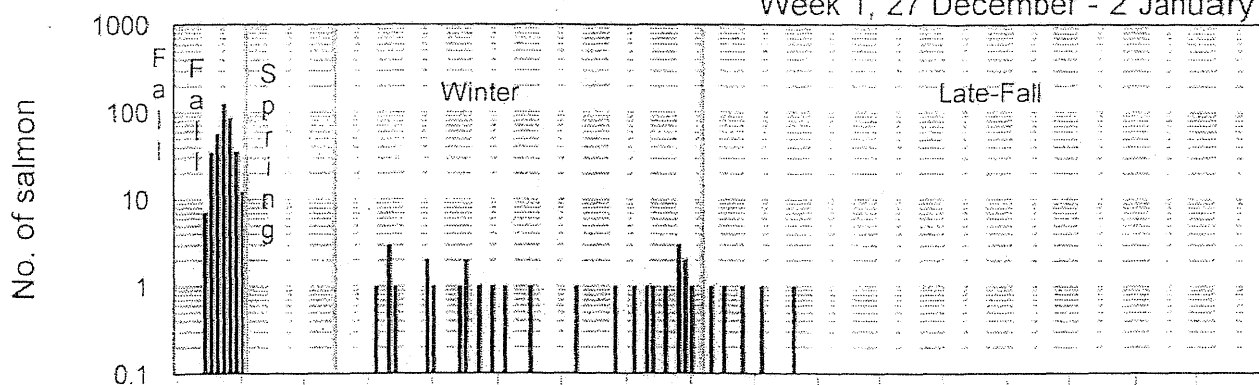


# Chinook salmon size distribution Upper Sacramento River rotary screw trap

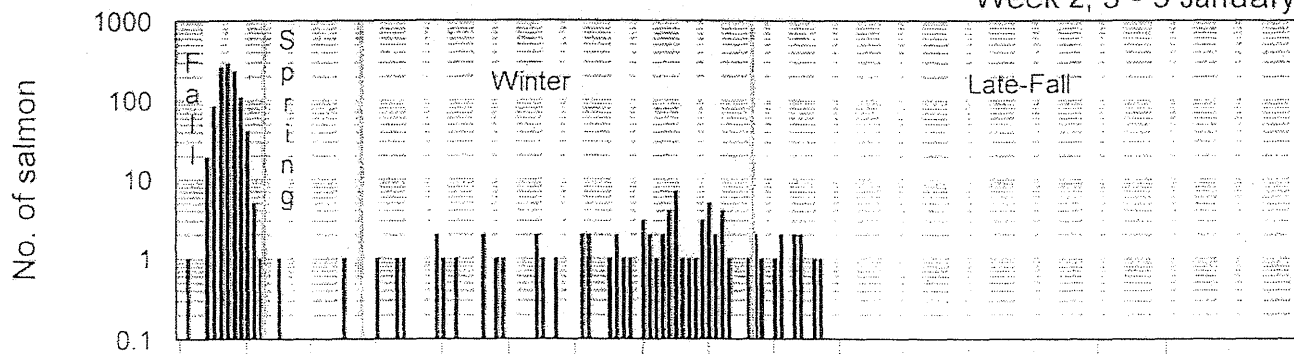
Week 52, 20 - 26 December



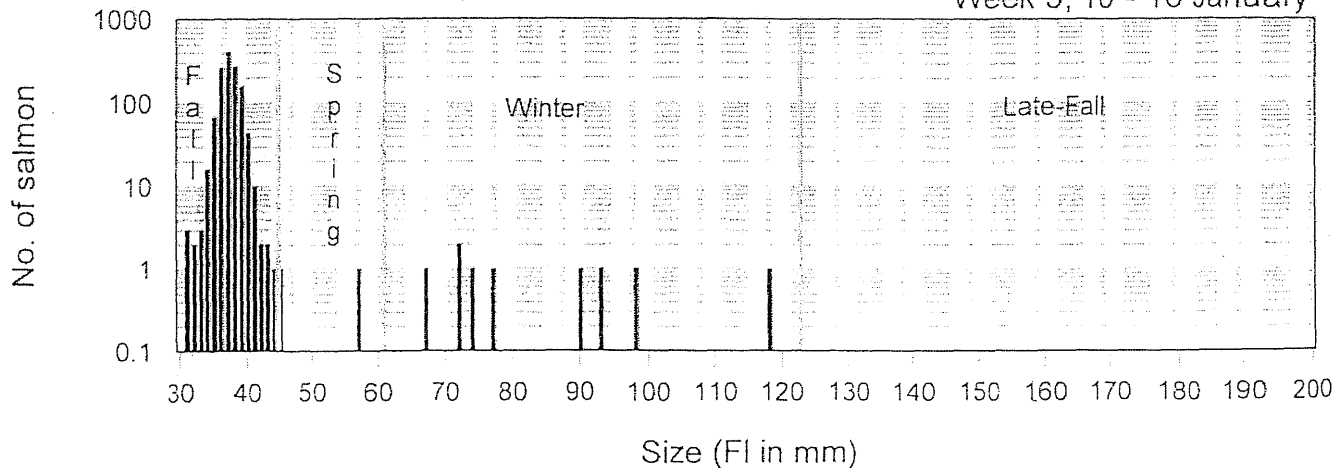
Week 1, 27 December - 2 January



Week 2, 3 - 9 January



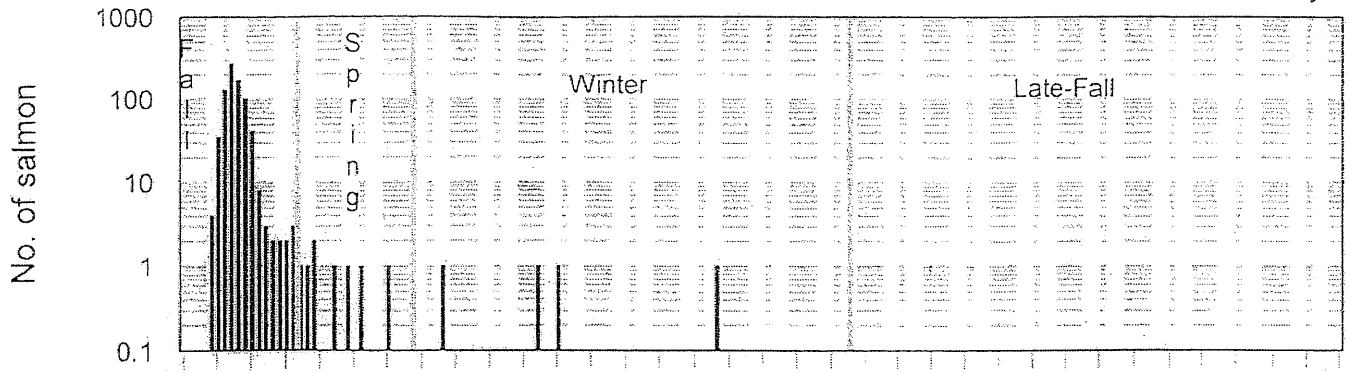
Week 3, 10 - 16 January



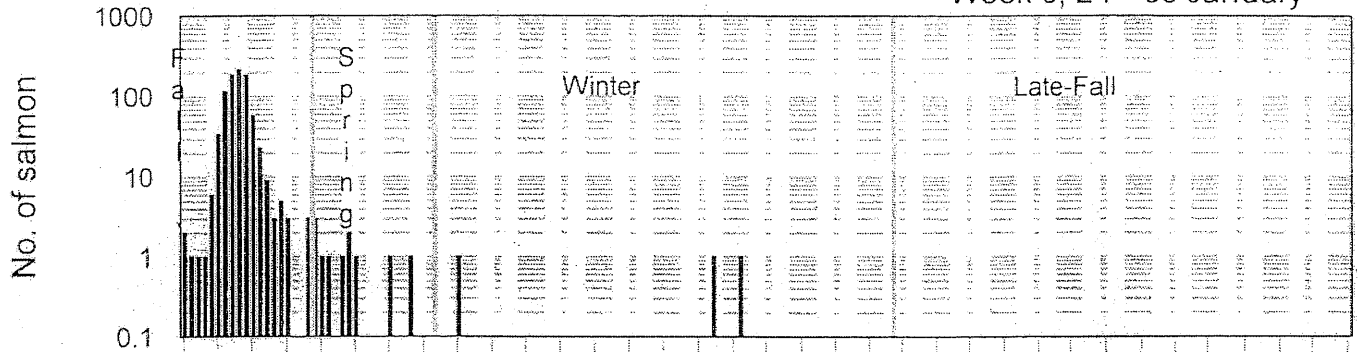
II-4. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 20 December 1998 - 16 January 1999

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

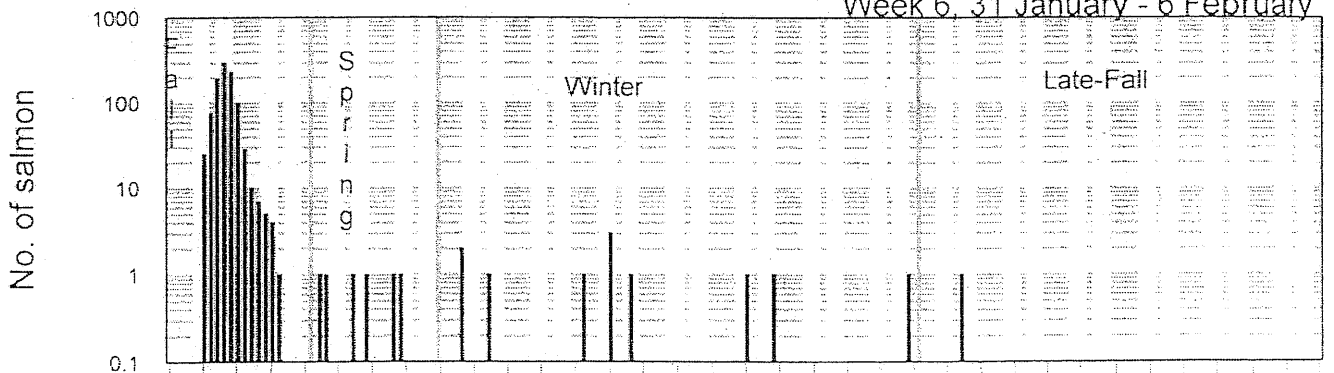
Week 4, 17 - 23 January



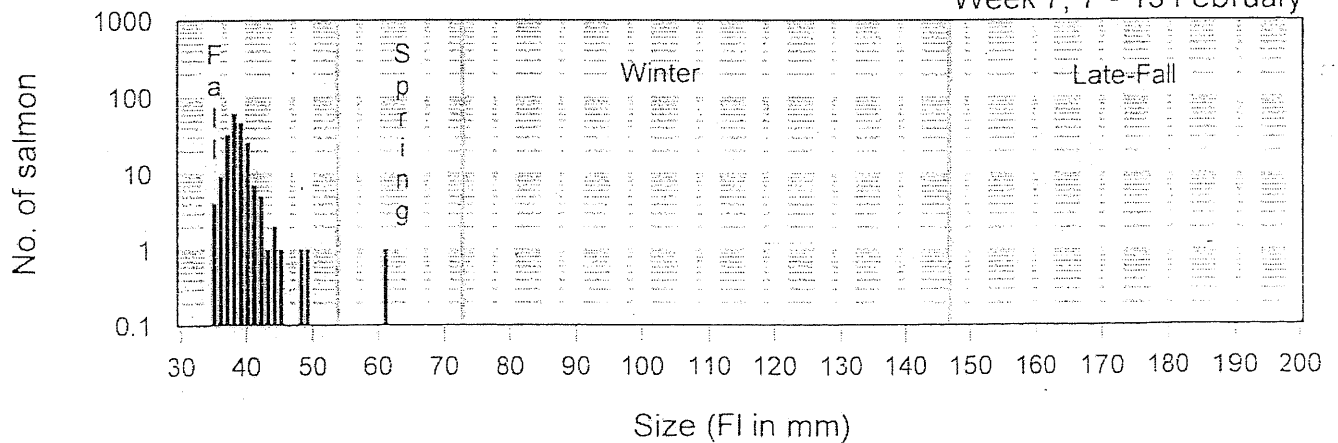
Week 5, 24 - 30 January



Week 6, 31 January - 6 February



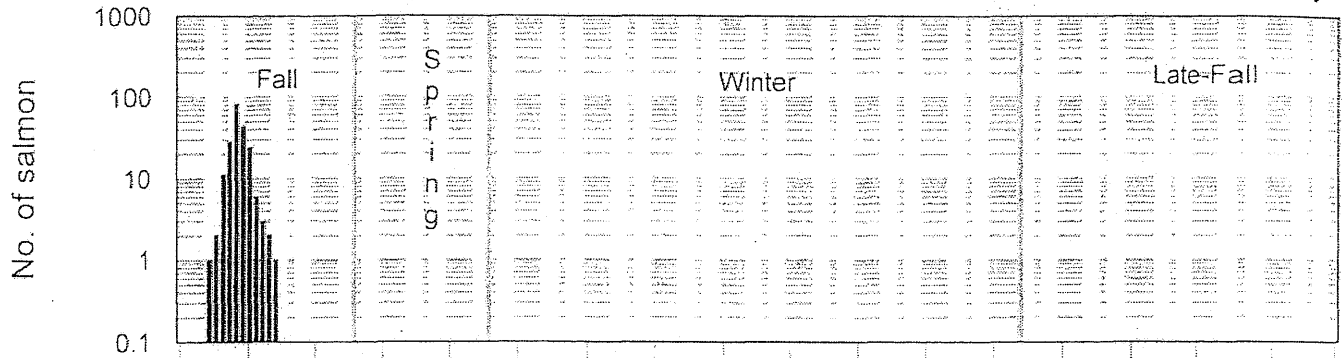
Week 7, 7 - 13 February



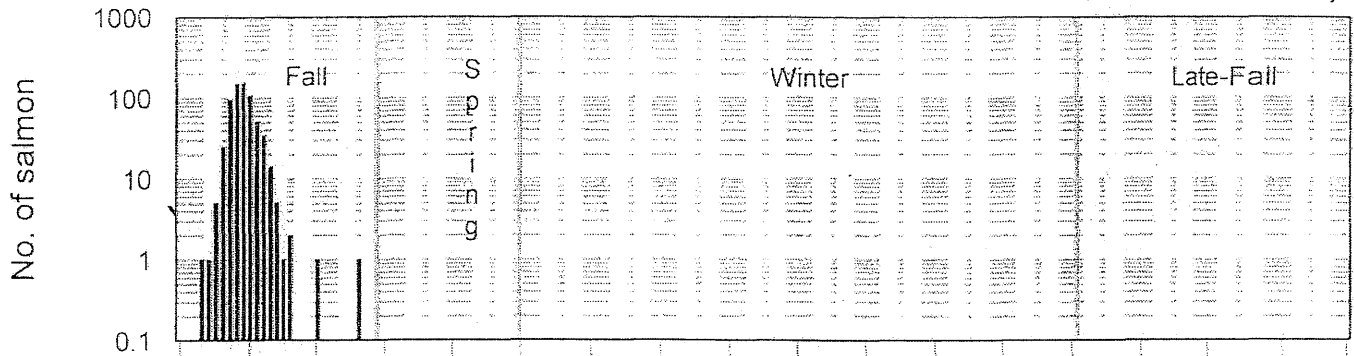
II-5. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 17 January 1999 - 13 February 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

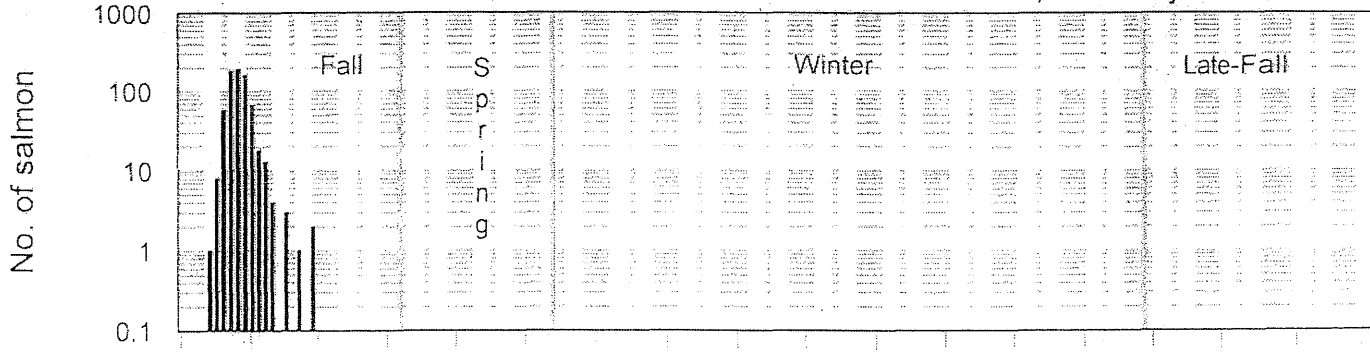
Week 8, 14 - 20 February



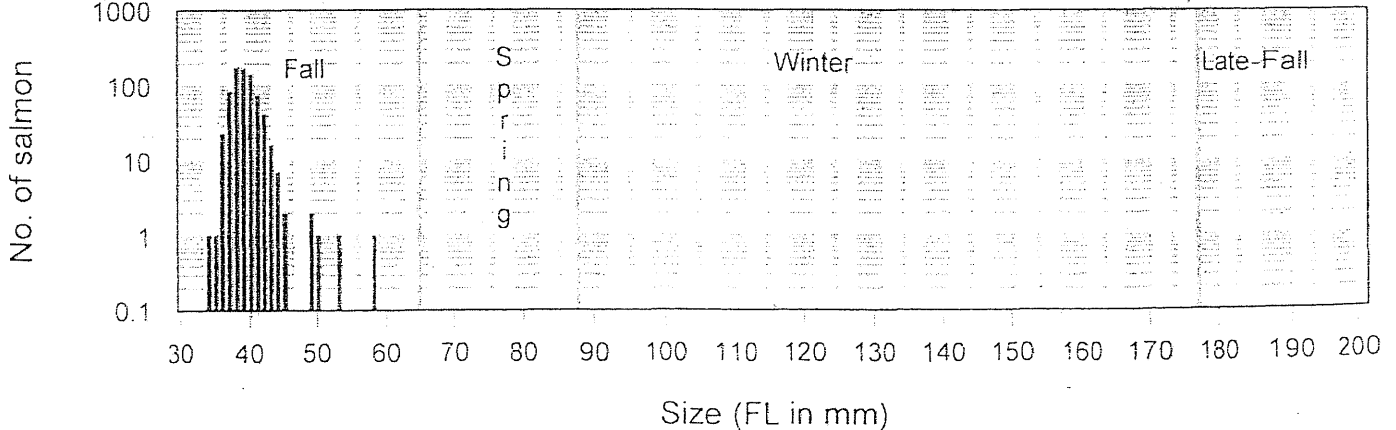
Week 9, 21 - 27 February



Week 10, February 28 - 6 March



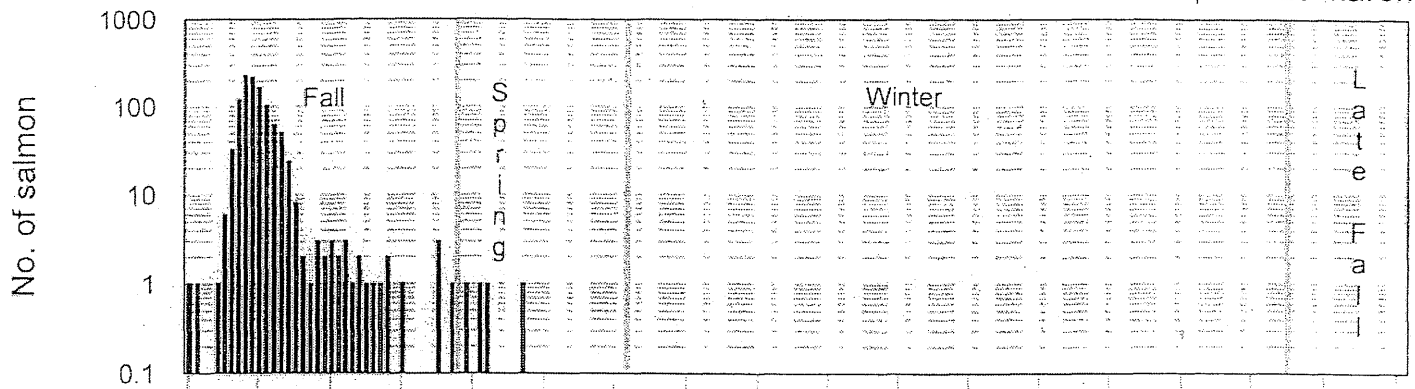
Week 11, 7 - 13 March



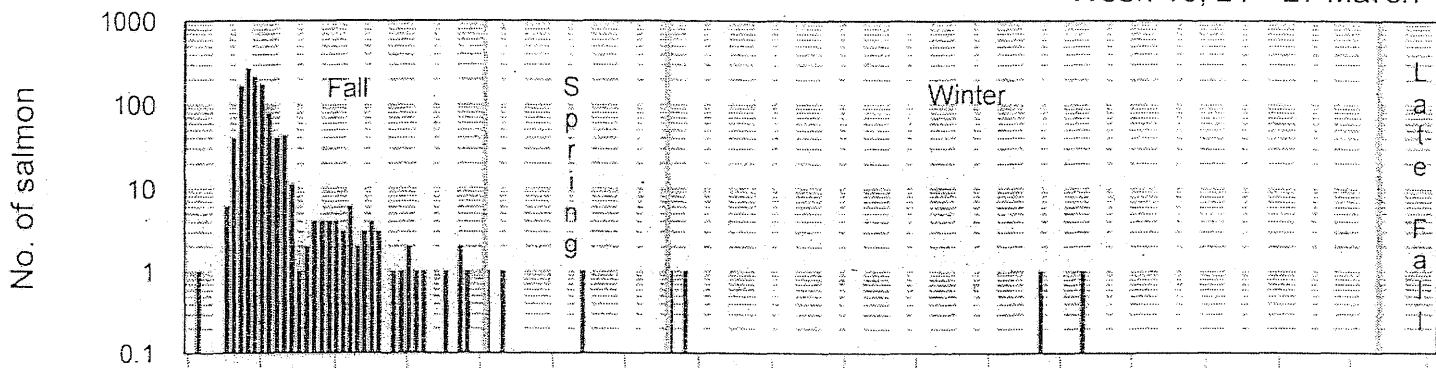
II-6. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 14 February 1999 - 13 March 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

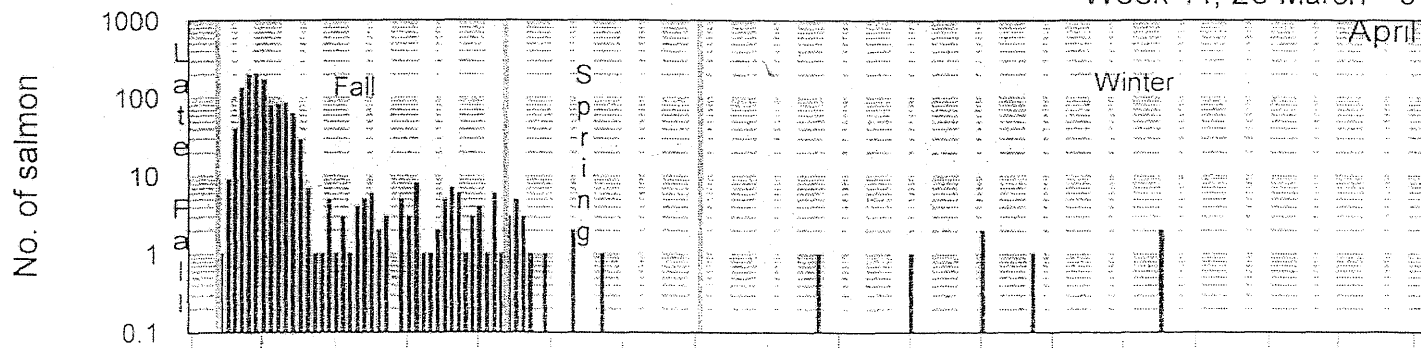
Week 12, 14 - 20 March



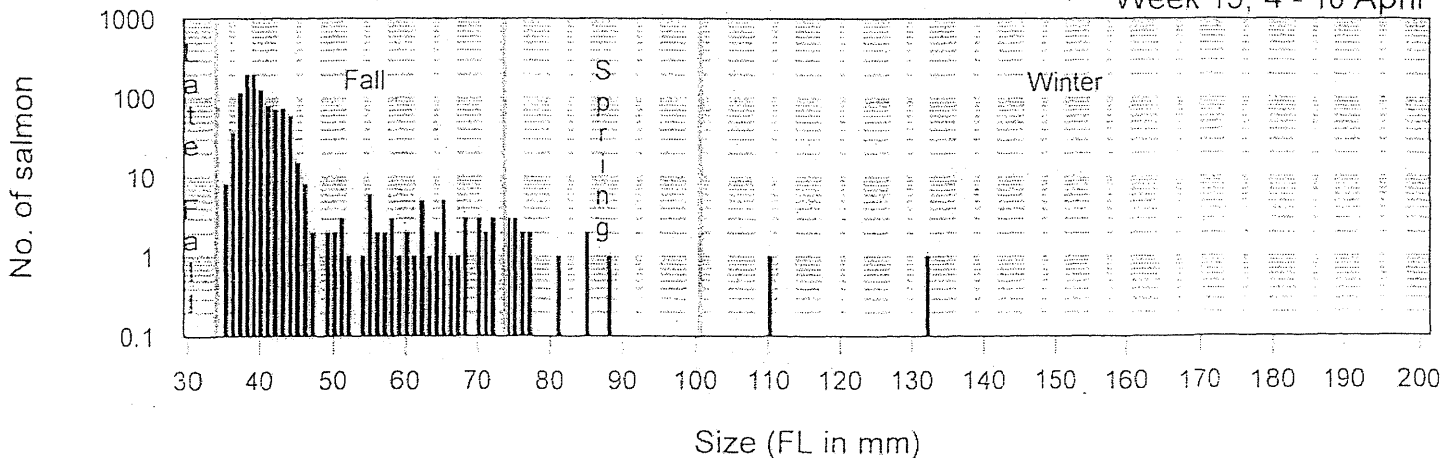
Week 13, 21 - 27 March



Week 14, 28 March - 3 April



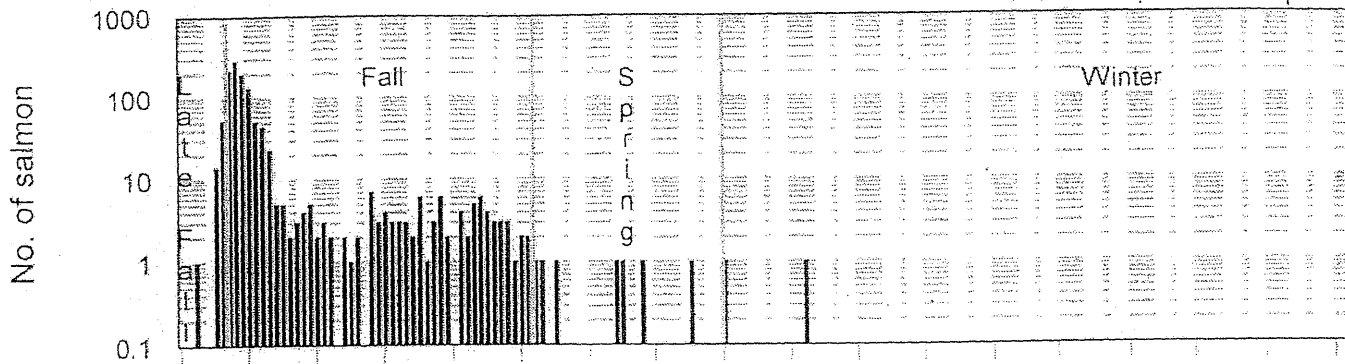
Week 15, 4 - 10 April



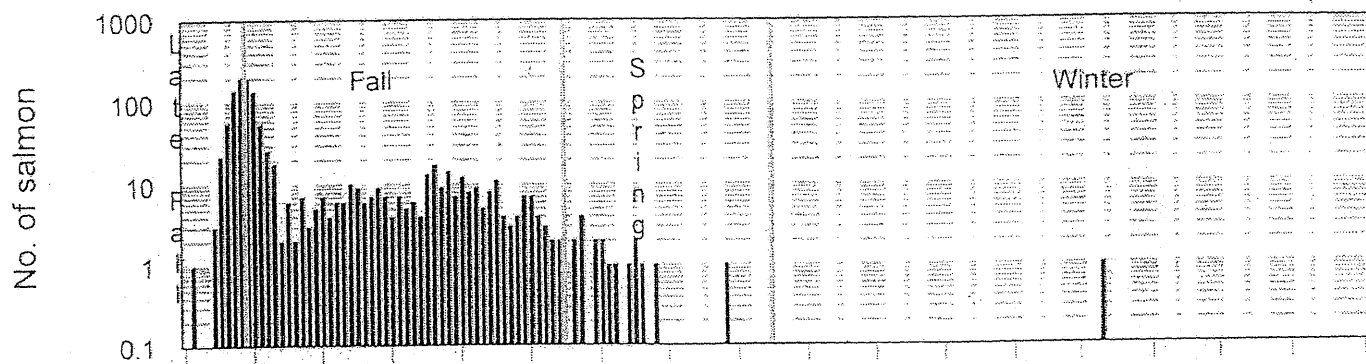
II-7. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 14 March 1999 - 10 April 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

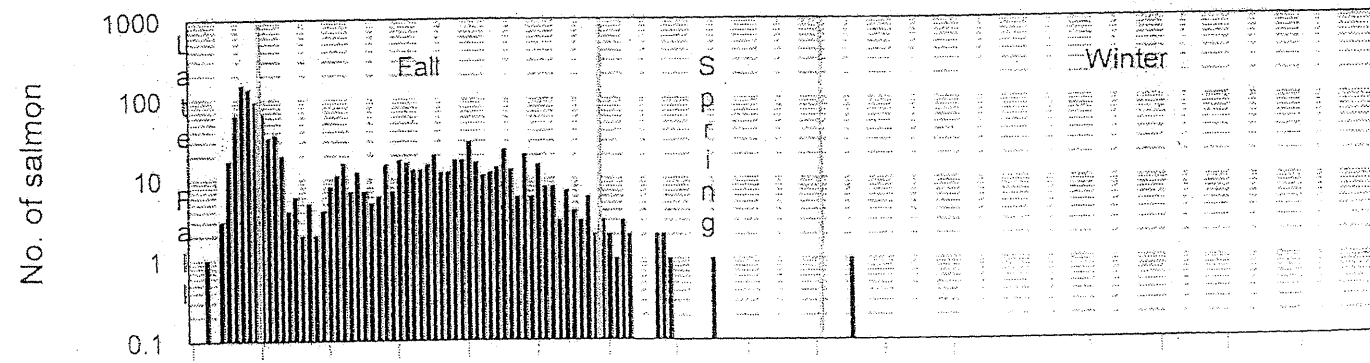
Week 16, 11 - 17 April



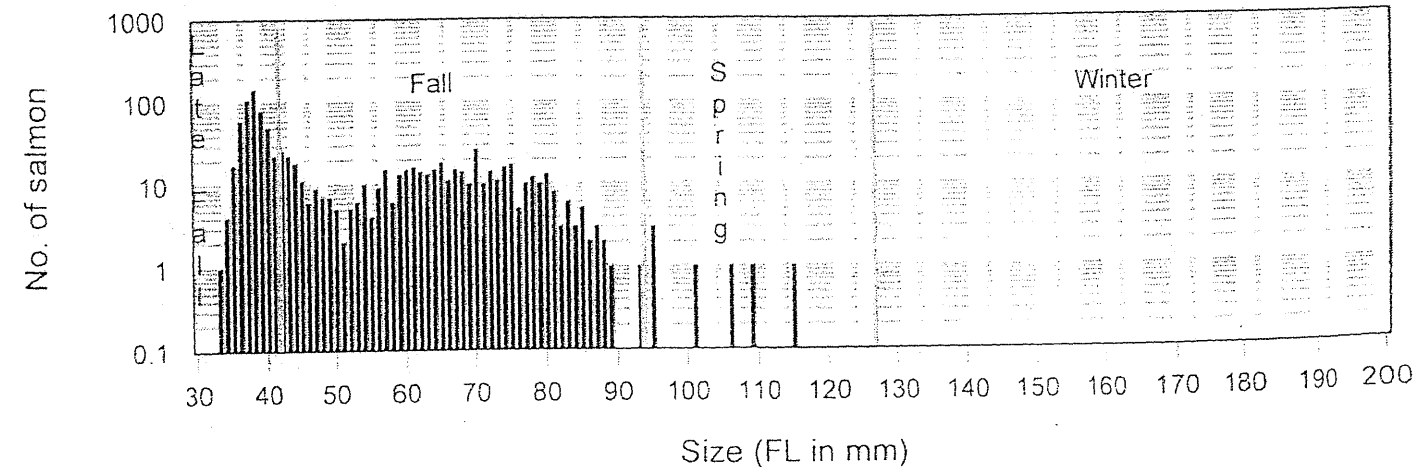
Week 17, 18-24 April



Week 18, 25 April - 1 May



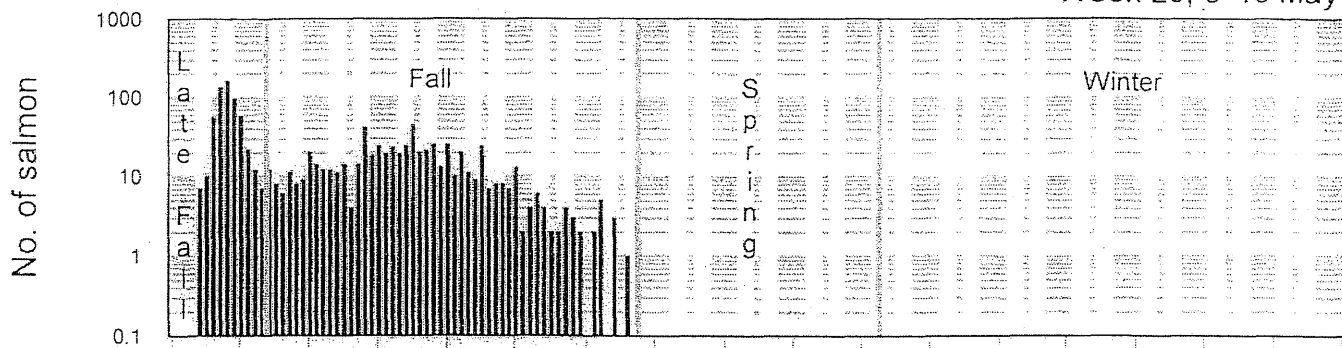
Week 19, 2-8 May



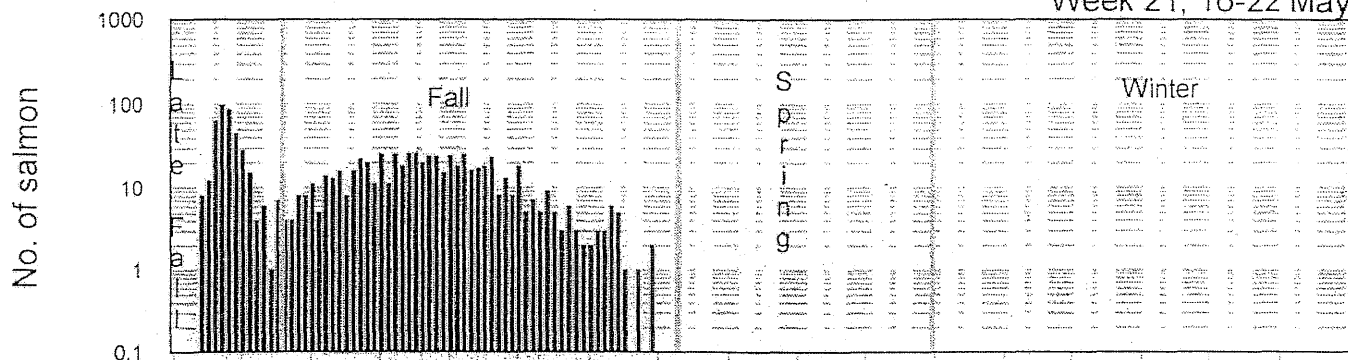
II-8. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 11 April 1999 - 8 May 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

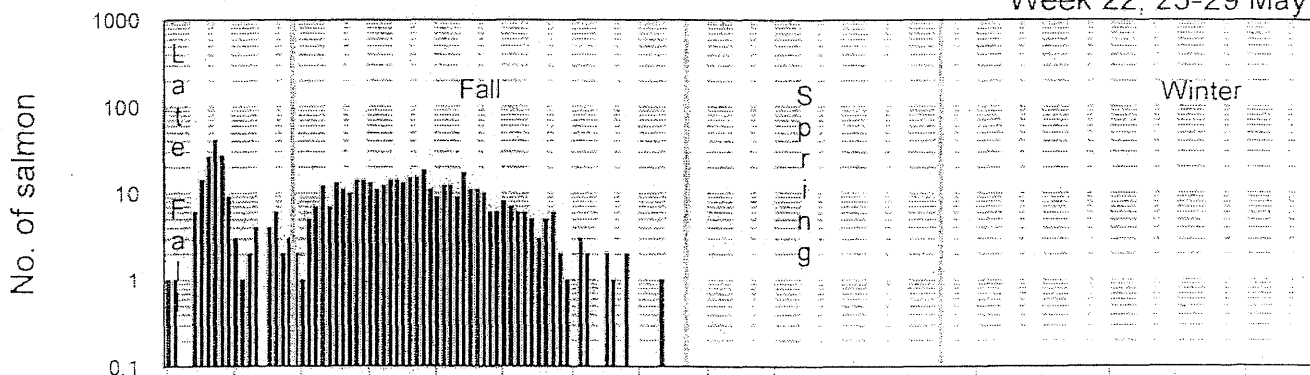
Week 20, 9-15 May



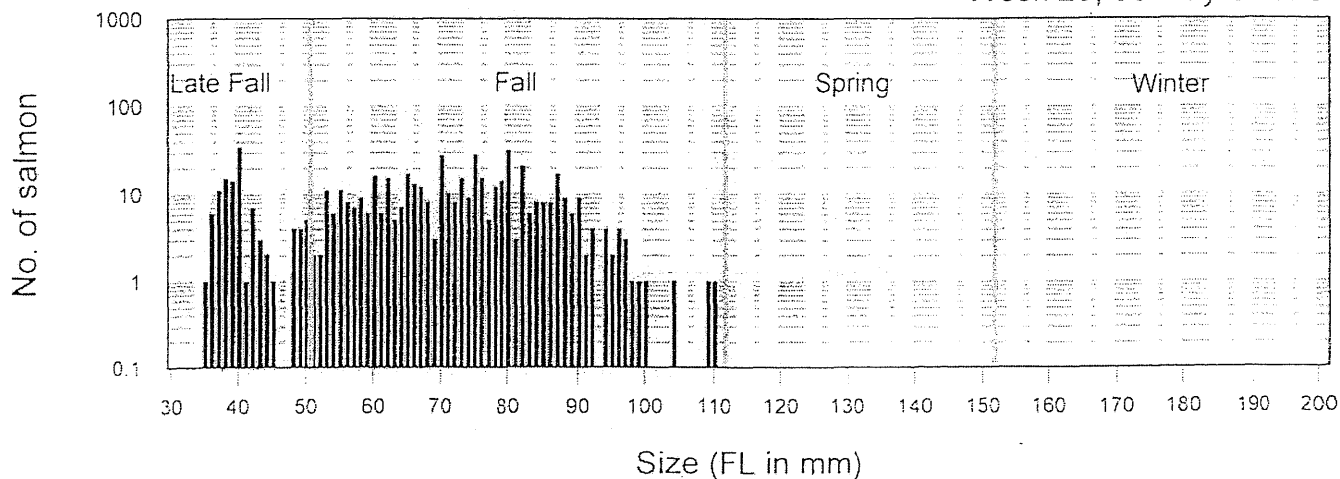
Week 21, 16-22 May



Week 22, 23-29 May



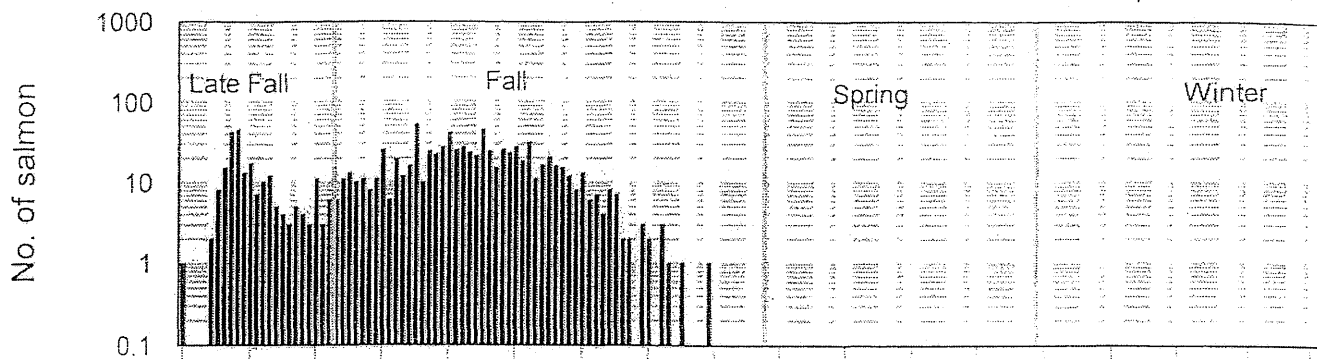
Week 23, 30 May-5 June



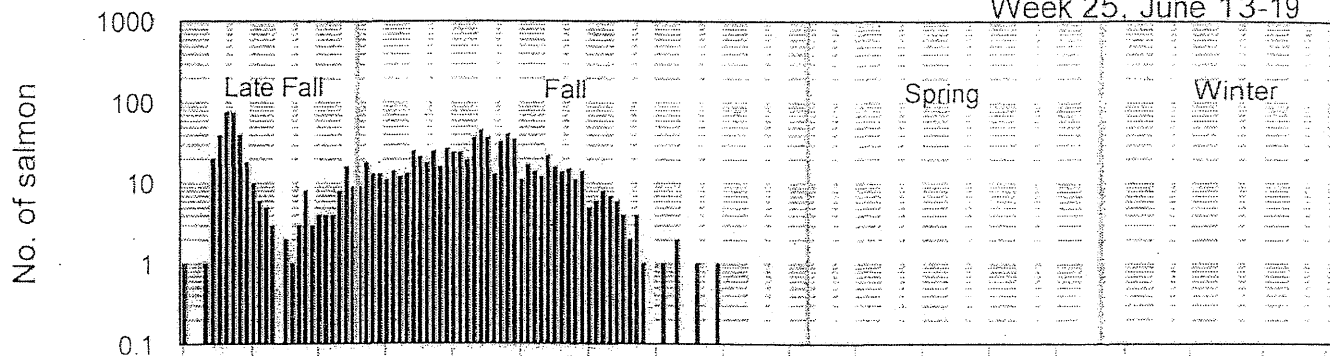
II-9. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 9 May 1999 - 5 June 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

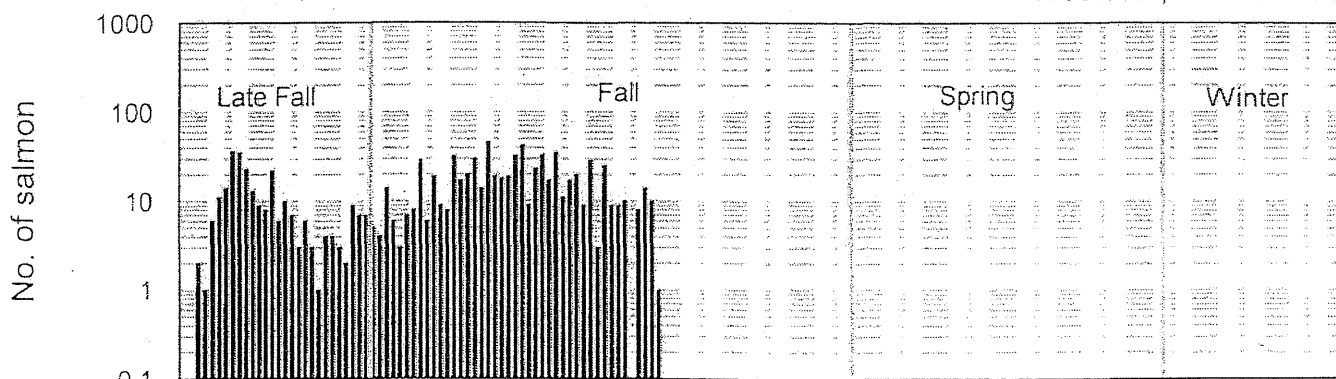
Week 24, June 6-12



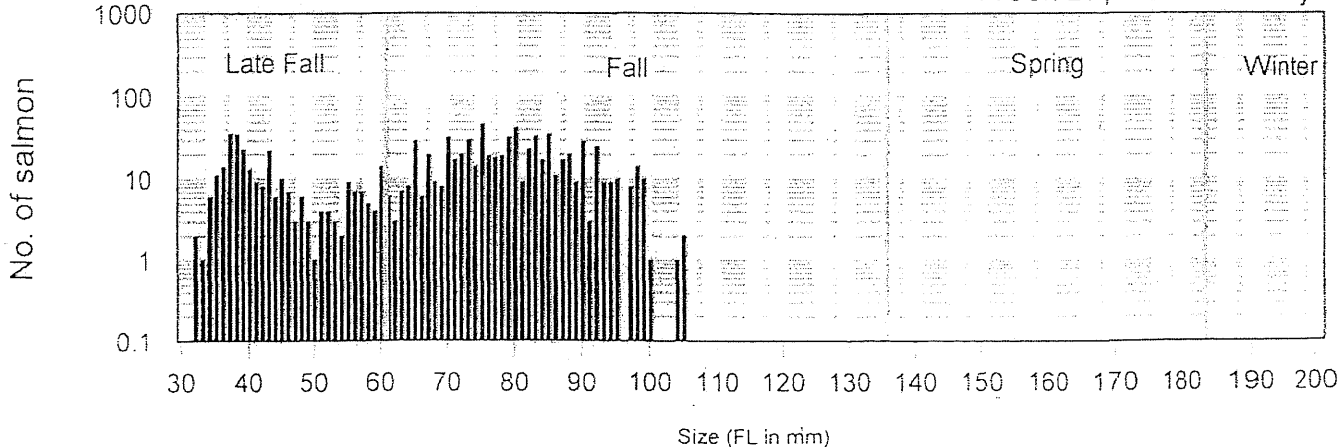
Week 25, June 13-19



Week 26, June 20-26



Week 27, June 27- July 3

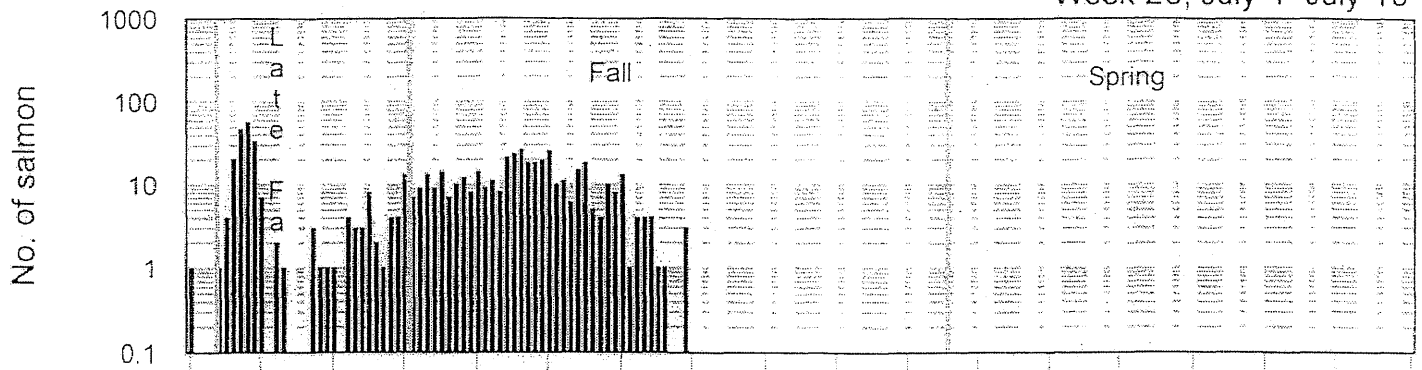


II-10. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 6 June 1999 - 3 July 1999.

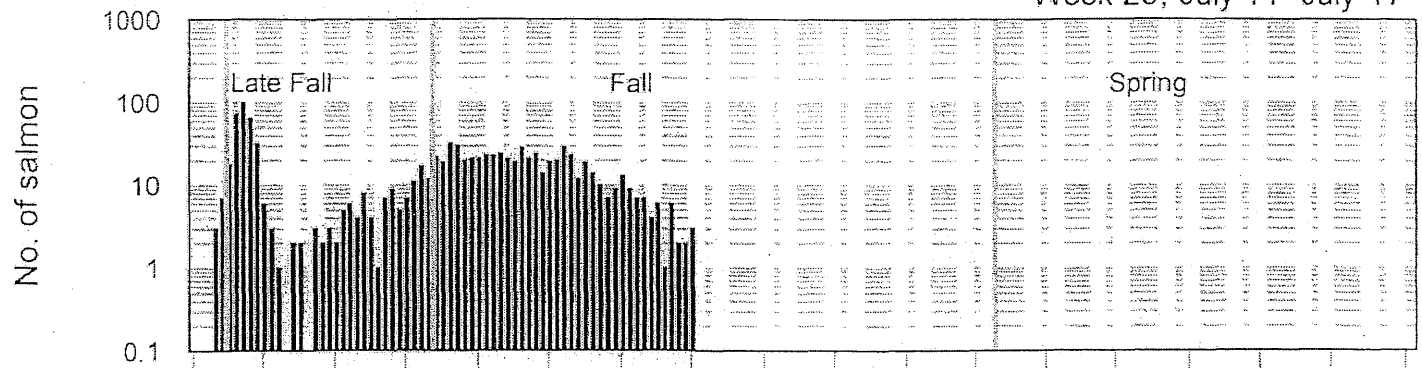


# Chinook salmon Size Distribution Upper Sacramento River rotary screw trap

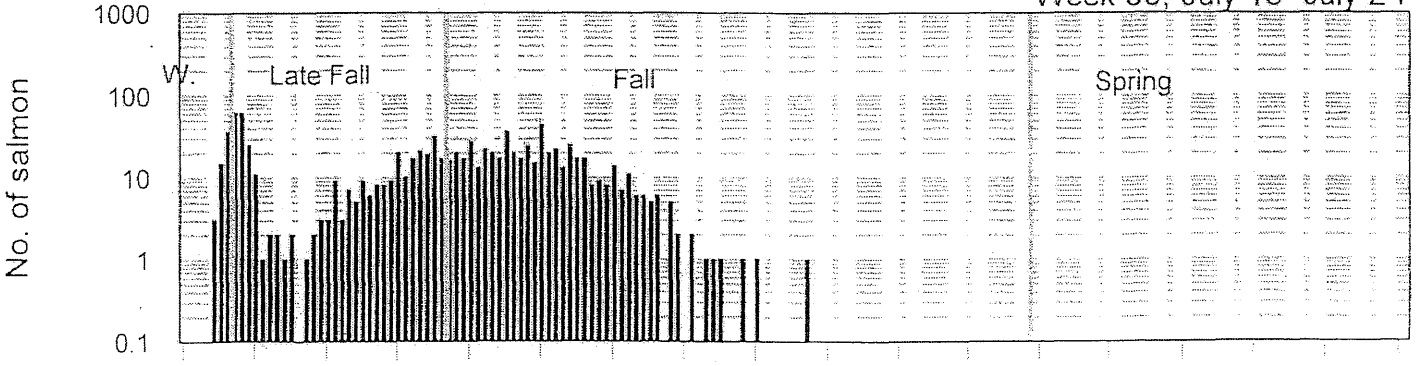
Week 28, July 4- July 10



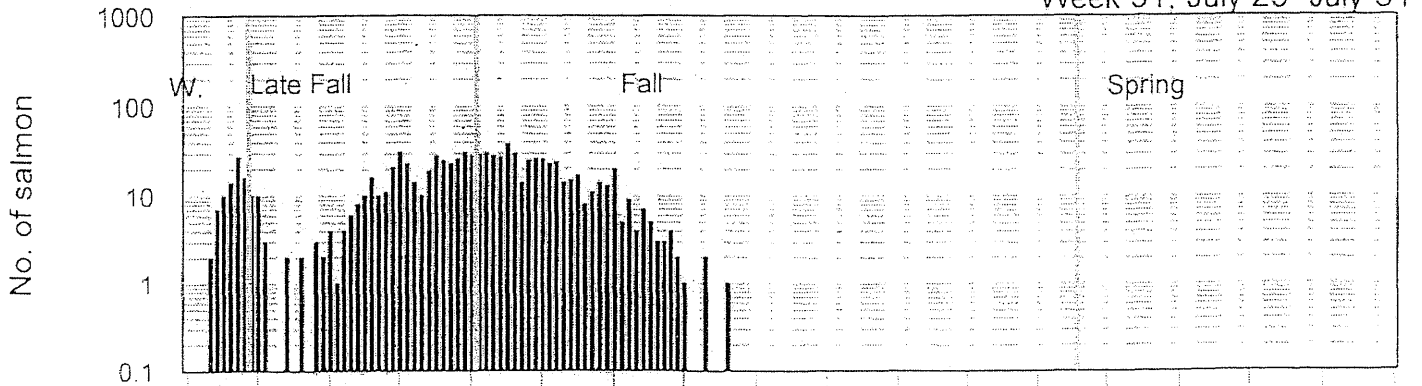
Week 29, July 11- July 17



Week 30, July 18- July 24



Week 31, July 25- July 31

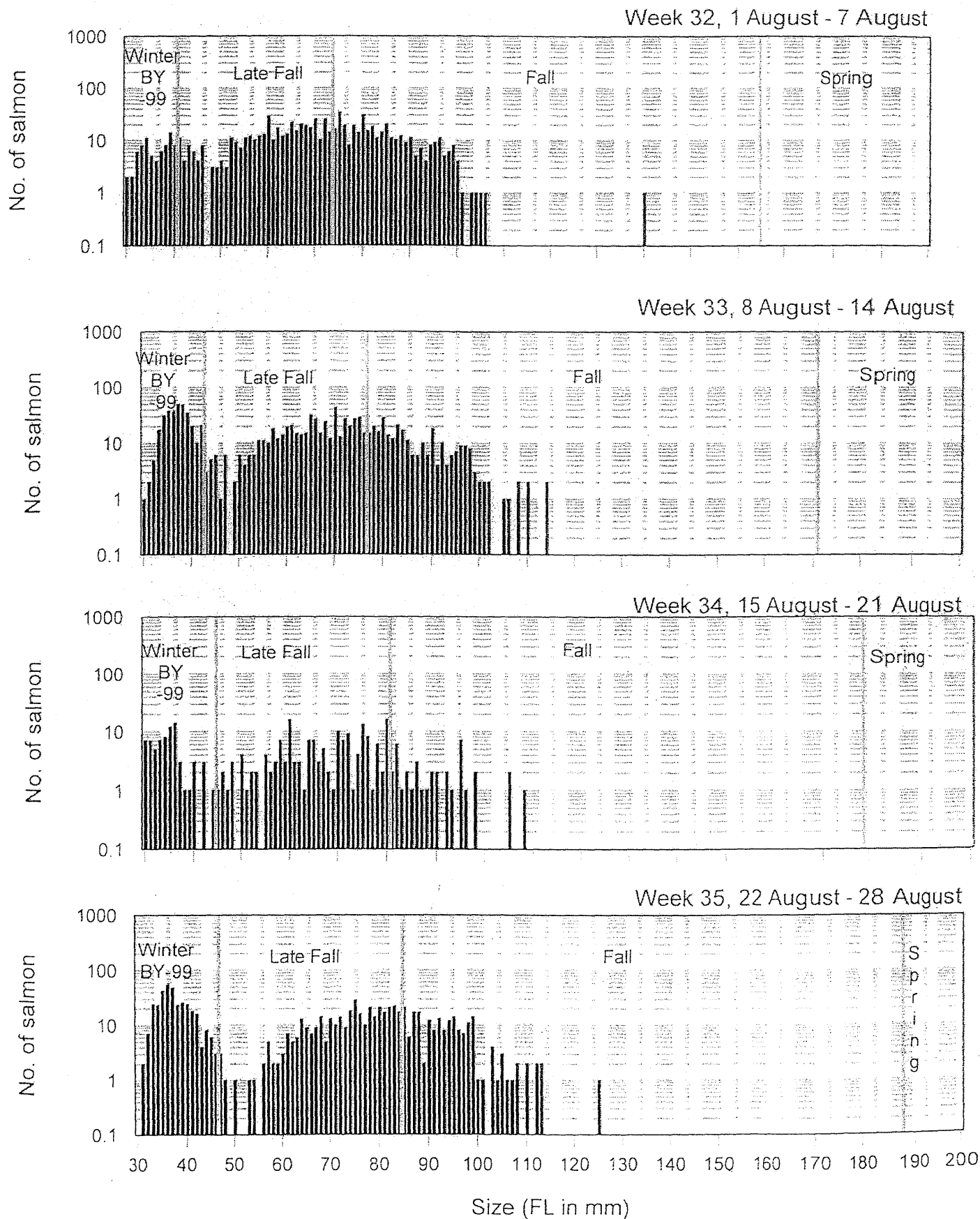


Size (FL in mm)

II-11. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 4 July, 1999 - 31 July, 1999.



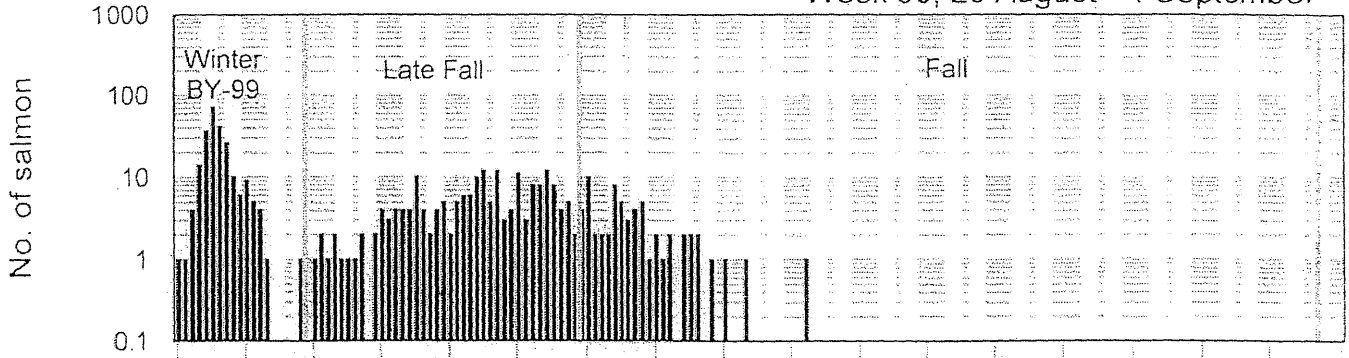
# Chinook salmon size distribution Upper Sacramento River rotary screw trap



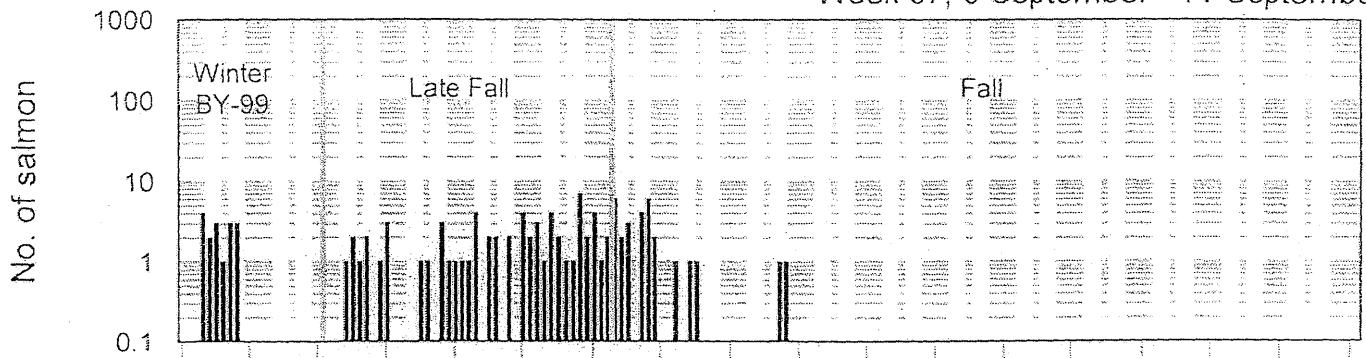
II-12. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 1 August 1999 - 28 August 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

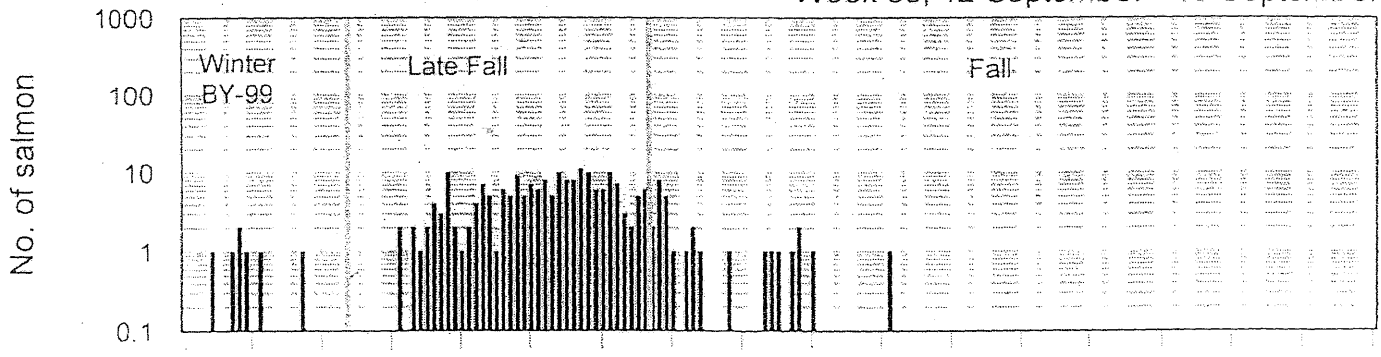
Week 36, 29 August - 4 September



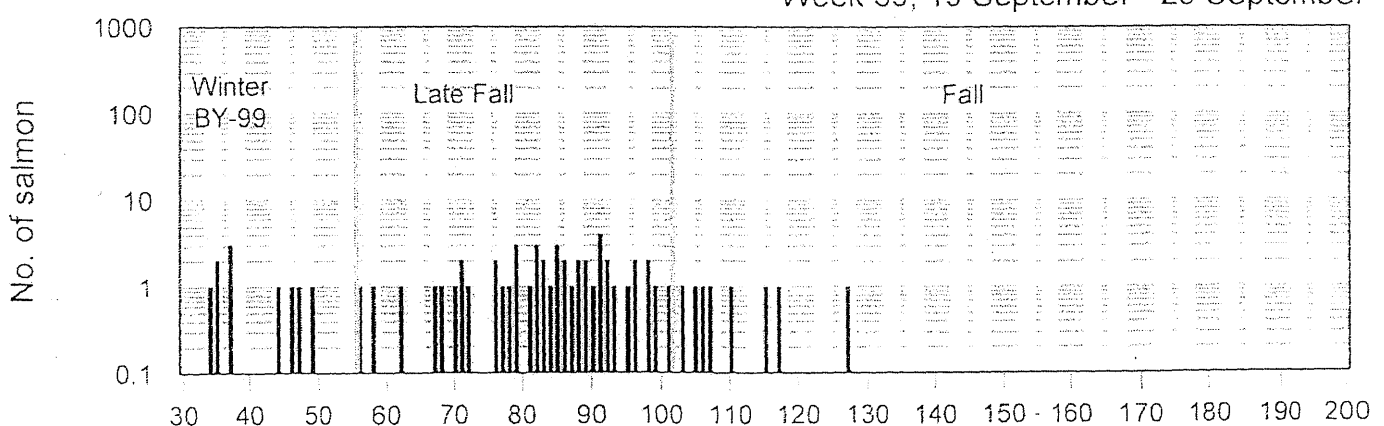
Week 37, 5 September - 11 September



Week 38, 12 September - 18 September



Week 39, 19 September - 25 September



II-13. Size distribution of chinook salmon caught by rotary screw traps in the upper Sacramento River, 29 August 1999 - 25 September 1999.

# Chinook salmon size distribution Upper Sacramento River rotary screw trap

Week 40, 26 September - 2 October

